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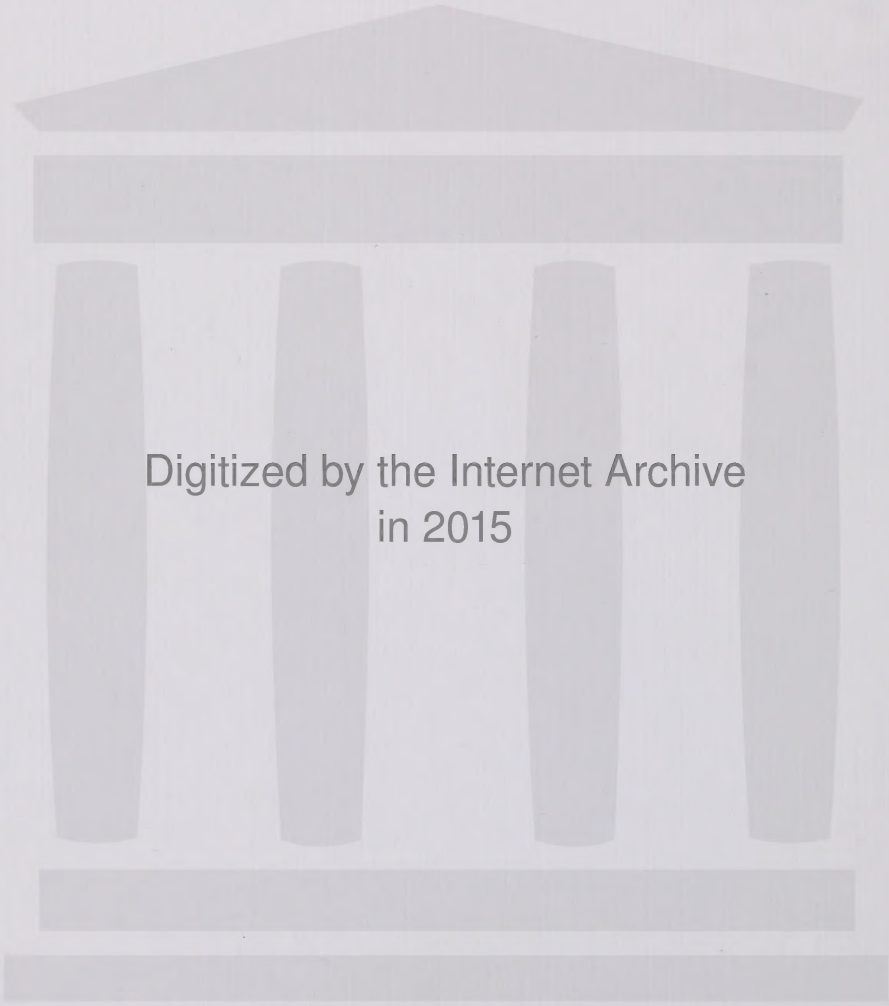
Management Plan for Mule Deer in Alberta

Wildlife Management Planning Series Number 1

Alberta
FORESTRY, LANDS AND WILDLIFE
Fish and Wildlife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MANAGEMENT PLAN FOR MULE DEER IN ALBERTA

Wildlife Management Planning Series

Number 1

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MANAGEMENT PLAN FOR MULE DEER IN ALBERTA

EXECUTIVE SUMMARY

Historical Populations, Use and Management

Mule deer populations declined to very low levels in the late 1800s due to high hunter harvests in combination with habitat loss and a series of very severe winters. Numbers recovered in the 1900s but have fluctuated up and down as the population responded to changes in habitat and variations in winter weather, drought and numbers of animals harvested. The mule deer population peaked in the 1950s with estimates of numbers greater than 150 000, declined in the 1960s and early 1970s (estimates of fewer than 60 000) due to several severe winters and a liberal harvest regime, and has increased in recent years (1985 estimate 86 000) under a conservative harvest regime and a series of successive mild winters.

Effective forest fire suppression (which results in larger trees taking over former low tree/shrub habitats that provide deer food), agricultural expansion and intensification, and other land uses that change vegetation have removed or decreased the quality of mule deer habitat. At the same time, some types of timber harvesting, agricultural expansion and other land uses have opened up the forest canopy and have created improved habitat conditions for mule deer. However, the net effect has been a loss of mule deer habitat in this century. Much of the remaining habitat has been occupied by white-tailed deer, a species that uses many of the same food and cover types as mule deer. This is particularly true in the parkland and forest-agricultural transition in Alberta where white-tailed deer are now the predominant species.

Mule deer were an important source of food and clothing material during the early settlement of Alberta. They still provide a supplemental source of meat for Albertans today, but their major value stems from the thousands of days of recreation they provide for both hunters and nonconsumptive users. The most dramatic increase in recreational hunting demand has occurred since 1950 as annual licence sales have increased from under 15 000 to exceed 60 000. Nonconsumptive interest

in wildlife has also burgeoned in recent decades as evidenced by a recent study indicating more than 80 percent of Canadians are involved in wildlife-related activities and deer are among the species people most like to see.

Management prior to the 1950s was limited to changing bag limits and adjusting season lengths. Parks and sanctuaries protected some habitat, but there was little concerted effort toward habitat retention. More recent efforts have refined hunting management but also concentrated on the identification and protection of habitat. Hunting refinements include the management of opportunity and harvest at the Wildlife Management Unit (WMU) level using limited-entry draws. Habitat protection efforts have focused on inputs to land use planning (e.g., Integrated Resource Plans) and land use referrals (e.g., timber cutblock plans and range improvement programs), retention incentives for habitat on private land, and habitat enhancement programs to maintain or improve habitat quality in specific locations.

Management Issues

The following four major issues must be addressed in future management programs:

1. Recreational allocation systems must be improved to optimize public use opportunities while recognizing the concerns of landowners and the desire to maintain a balanced age structure in the mule deer herd.
2. More effective means of retaining and enhancing habitat in cooperation with other land users on both private and public lands must be developed.
3. Mule deer population and habitat inventory must be improved to allow more precise population estimates, resulting in reduced fluctuations in numbers of deer and increased recreational opportunity.
4. Deer damage must be minimized by managing deer numbers within acceptable goals, by implementing prevention programs (e.g., fencing, habitat enhancement) and by maintaining an effective compensation program.

Failure to address these major management issues will result in long-term declines in hunting and nonconsumptive recreational opportunity because of loss of mule deer habitat, declines in mule deer numbers and reduced access to private land.

The Management Plan - Goals/Objectives

1. The provincial summer mule deer population will be increased to 97 000 from the 1985 estimate of 86 000 by 1996 to satisfy identified public use goals. It will be necessary to provide 48 000 km^2 of summer range and 18 000 km^2 of winter range to meet this population goal.
2. A variety of hunting opportunities (e.g., any buck, trophy buck, antlerless deer, and archery only areas) will provide for 49 000 Alberta residents to harvest 17 000 mule deer annually. Limited-entry draws will manage the distribution and number of hunters to provide a quality recreational experience, to protect the resource and to minimize disturbance of landowners.
3. Nonconsumptive activities will involve use of print, film and audiovisual material to enhance knowledge and personal contact using viewing guides and interpretive sites.
4. Commercial opportunities in game farming, public display and outfitting-guiding will be available. An abundant and widely available mule deer population will be a major attraction for tourists to come to Alberta.
5. Scientific research and educational activities will be encouraged to enhance our knowledge of mule deer and lead to improved management capabilities.
6. Damage prevention, control and compensation programs will continue. Compensation will be expanded to include additional crops and may include on-farm habitat improvements that benefit both deer and livestock.
7. Effective habitat retention will require significant compromise (within the context of land use planning, land use referrals and cooperative agreements) between wildlife managers and those who control or use the land within mule deer habitat in Alberta

(private landowners, timber companies, range managers, oil and gas companies, mining companies, outdoor recreationists).

8. Improved habitat and population monitoring programs will support the establishment of habitat and population goals at the WMU level. Monitoring will also provide a measure of progress toward maintaining/attaining these goals over time.

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PREFACE

The plan presents the Fish and Wildlife Division's goals, objectives and management strategies for the management of mule deer in Alberta, and will be updated periodically and revised as necessary. Implementation will be subject to divisional priorities established during the budget process.

1.0 INTRODUCTION

Mule deer were important in the development of Alberta and continue as a desirable entity in Albertans' lives today. Historically, they provided essential food and clothing for Natives and European fur traders and settlers. Although mule deer still provide a supplemental meat source and hides, which are used for specialty clothing items, their major present-day value stems from the hundreds of thousands of hours of recreational enjoyment by hunters and other outdoor enthusiasts. Mule deer also enhance the Alberta economy by stimulating the internal flow of resident dollars and increasing the flow of non-resident dollars into the province.

Recognizing the value of the wildlife resource, the Government of Alberta declared a Fish and Wildlife Policy for Alberta in October, 1982 (Alberta Fish and Wildlife 1982). The wildlife policy stated that the government is to ensure that wildlife populations are protected from severe decline, that viable populations are maintained and that the wildlife resource is passed on to future generations as it was received. The Status of the Fish and Wildlife Resource in Alberta (Alberta Fish and Wildlife 1984) provided a brief statement of the history, the supply and use of mule deer in 1980, and a general statement of future goals respecting mule deer populations and habitat. The purpose of this species management plan is to review the history and current management program for mule deer in Alberta in more detail and develop comprehensive user, population and habitat goals that will guide the management of mule deer over the next 10 years.

2.0 BACKGROUND TO THE PLAN

2.1 Taxonomy, Biology and Requirements of Mule Deer

2.1.1 Taxonomy and Distribution

The mule or black-tailed deer (Odocoileus hemionus) is found throughout western North America (Figure 1, after Wallmo 1978). There are 11 subspecies of Odocoileus hemionus of which seven are unequivocally recognized (Figure 1), leaving the status of four subspecies open to discussion by taxonomists (Wallmo 1978). The Rocky Mountain mule deer (Odocoileus hemionus hemionus) is the only subspecies found within the borders of the Province of Alberta (Soper 1964; Banfield 1974; Wallmo 1978). It has been reported in all areas of the province including the prairies, parklands, foothills, mountains and boreal forest. The term "mule deer" will mean the Rocky Mountain mule deer throughout this document.

2.1.2 General Description

Mule deer are often confused with white-tailed deer in Alberta. Although the mule deer has a larger chest girth, weights of the two species were almost identical in Camp Wainwright, Alberta, where the largest males exceeded 131 kg (290 lb.) and the largest females were in the 80 kg - 88 kg (176 lb. - 194 lb.) range (Wishart 1986). However, there are many differences between the two species as summarized by Wishart (1986) in Table 1. The most notable differences are the size, shape and color of the tails (good for differentiation in the field), and the size and location of the metatarsal glands. The antlers of the adult males of the two species also differ distinctly.

The dichotomous antlers of the mule deer are shed annually. Yearlings average just over two points per side and adults usually have four points to a side (Wishart 1986). Anderson and Medin (1969) found that antler weight and antler beam diameters increased with age (their

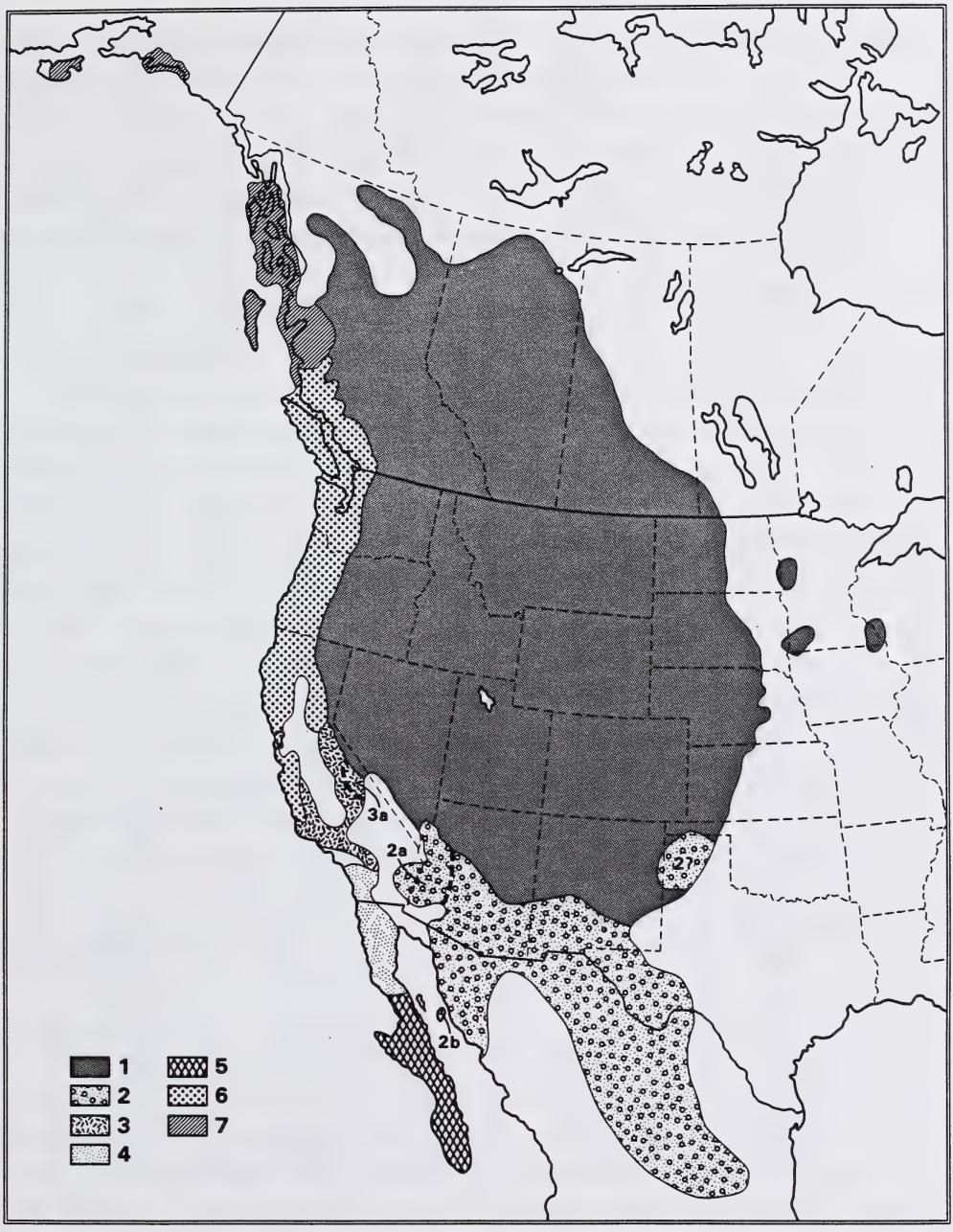

Figure 1. Geographic range of mule deer subspecies: (1) *O.h. hemionus;* (2) *O.h. crooki;* (3) *O.h. californicus;* (4) *O.h. fuliginatus;* (5) *O.h. peninsulae;* (6) *O.h. columbianus;* and (7) *O.h. sitkensis.* Current documentation was not found for *O.h. ermicus* (2a) and *O.h. sheldoni* (2b) while *O.h. inyoensis* (3a) is in doubt. (Adapted from Figure 7, page 32, Big Game of North America, 1978, with permission of the Wildlife Management Institute)

Table 1. Characteristics for separating mule deer and white-tailed deer.

Characteristics	Mule Deer	White-tailed Deer
Metatarsal glands	125 mm (5 in.) surrounded with brown hairs, located in upper half of metatarsus	25 mm (1 in.) surrounded with white hairs, located in lower half of metatarsus
Interdigital glands	surrounded with brown hairs	surrounded with white hairs
Tarsal glands	usually brown or light tan	usually white or nearly white
Tail	round and white with a black tip, half naked on the underside	long, bushy and brown with white fringe, white below and fully haired becoming a conspicuous flag when elevated
Rump patch	conspicuous white at all times	white rear inconspicuous when covered by brown tail
Ears	200 mm (8 in.) with conspicuous black trim	160 mm (6 in.) with occasional black trim
Preorbital glands	large, conspicuous and deep	inconspicuous and shallow
Facial markings	dark forehead or eyebrows contrasting with grey or brown muzzle	white eye rings and white nose band
Coat color	grey with black trimmings, dark chest, white belly	brown with white trimmings, conspicuous white ventral strip from front to back
Antlers	dichotomous branching (forked) with poorly developed brow tines and long back tines, wide tip to tip spread	single branches from the main beam with well-developed brow tines and relatively short back tines, narrow tip to tip spread
Skull	deep lacrimal pit, wide orbit width	shallow lacrimal pit, narrow orbit width
Incisors	large wide	small narrow
Running gait	high vertical bounds	low leaps and bounds

samples included deer up to 6.5 years old) in a Colorado mule deer herd. Mule deer have been known to live for 20 years (Banfield 1974). In Alberta, the oldest wild mule deer recorded to date was 15.5 years of age but few live past 10 years (Triechel 1977-1985). Connolly (1981) quoted a number of studies in which it was shown that an increase in hunting intensity will decrease the average age of the hunted population.

2.1.3 Reproduction

The breeding season for mule deer in Alberta occurs between mid-November and mid-December, usually peaking during the last week of November (Wishart 1986). Most breeding occurs within a span of two weeks, judging from when fawns are dropped (Wallmo 1978). The mean period of gestation is 203 days with an individual variance of as much as 30 days (Wallmo 1978). Normally, does produce young after two years of age. Younger does (18-24 months) have a pregnancy rate of 80 percent, while in older does this rate rises to a little over 90 percent (Robinette 1956). A review of data from five American states revealed an average pregnancy rate of 86 percent with a fetal rate of 1.5 per doe (Robinette 1956). Wishart (1986) found fetal rates of 1.8 per adult doe in Wainwright, Alberta. Most fawns in Alberta are born within a two-week period in mid-June (Wishart 1986).

2.1.4 Mortality

2.1.4.1 Climate

Wishart (1986) concluded that deer numbers in Alberta are generally regulated by low temperatures and the duration of snow cover rather than the condition of the range, with November, March and April being the most critical months. If green forage is not available by mid-April, fawn survival rates generally decline (Wishart 1986; Hall 1973). Aerial survey data (e.g., Red Deer River before and after the severe winter of 1973-74) indicate that winter mortality may result in population declines as high as 40 percent. Drought may also reduce mule deer populations.

2.1.4.2 Predators

Connolly (1981) described several case histories regarding the impact of coyotes, wolves and mountain lions on mule deer populations in several western states. The impact of predators in these studies was highly variable. In Alberta mule deer are important in the diet of cougars (Jalkotzy et al. 1984) and wolves (Carbyn 1974; Bjorge and Myers 1978), and have been reported as prey for coyotes and bobcats, but the effect of this predation on mule deer population has not been documented to date.

2.1.4.3 Parasites and Disease

Wishart (1986) provided a good overview of parasites and disease in the two deer species in Alberta. He referenced the following for mule deer:

Parelaphostrongylus odocoilei (mule deer muscleworm) - Pybus and Samuel (1981, 1984);

Epizootic hemorrhagic disease (a viral disease) - Chalmers et al. (1964);

Sarcocystis spp. (protozoan parasites) - Mahrt and Colwell (1980);

Gastro-intestinal helminths (tapeworms and roundworms) - Stock (1978);

Tricholipeurus spp. (chewing lice) - Samuel et al. (1980); and

Cephenemyia spp. (nose bots) - Wishart (1986).

Pybus and Samuel (1984) indicated that P. odocoilei is potentially serious for mule deer; however, no disease linked to this muscleworm has been discovered in western Canada. A more serious threat may come from Parelaphostrongylus tenuis, a worm found in white-tailed deer in eastern North America and related to the muscleworm. This worm, although tolerated by white-tailed deer, causes excessive trauma to the central nervous system, which may result in neurologic disease and death in mule deer (Hibler 1981). It has not been recorded west of Manitoba in Canada, but has been moving slowly westward; furthermore, there is a major concern that infected white-tailed deer will be accidentally moved to Alberta (Wishart 1986). An outbreak of epizootic hemorrhagic disease occurred in Alberta in 1962, when 18 mule deer and 440 white-tailed deer were found dead in southern Alberta (Chalmers et al. 1964). The impact

of the other parasitic infections on mule deer in Alberta is unknown but probably not significant.

2.1.4.4 Competition With Other Ungulates

White-tailed deer, elk, moose and domestic cattle coexist with mule deer to varying degrees throughout the province. Although there is dietary overlap between these species and mule deer (Peek 1974; Nowlin 1976; Rhude and Hall 1978; Berg 1983), the competitive impact of this overlap is quite variable.

Kramer (1971) suggested that the competitive factor between the two deer species is not great in natural habitat. However, Rhude and Hall (1978) demonstrated considerable dietary overlap between the two deer species in Camp Wainwright. Even though Hall (1973) and Wishart (1986) suggested that deer numbers in Alberta are regulated by the duration of snow cover and low temperatures rather than range condition, this dietary overlap could be a problem in some winters. Berg (1983) found very little diet overlap between mule deer and elk or mule deer and cattle in the Bob Creek area of southwestern Alberta. Austin and Urness (1986) concluded that in spite of dietary overlap between mule deer and cattle in mixed browse communities in the great basin of the United States, the impact on mule deer is minor when cattle use is controlled such that cattle primarily use only understory vegetation. However, at heavier levels of cattle use, the diet composition of the deer changed, the deer were forced off potential range and percent dietary crude protein was reduced. Jaques (1980), working in the Red Deer area of central Alberta, indicated that heavy livestock grazing reduced the primary deer browse species to about 10 percent of that expected under light to moderate deer-only browsing. Although there is considerable overlap in range and browse species of moose and mule deer (Peek 1974; Rhude and Hall 1978), direct competition has not been demonstrated in Alberta.

2.1.4.5 Accidents

Vehicle collisions resulted in the death of one mule deer for every six taken by hunters or an estimated total of 2000 across the province (Bruns 1976). Data from the Alberta Insurance Bureau in 1980 indicated

a total of 2992 automobile accidents involving collisions with wild and domestic animals (Sanderson 1983). Although no species were identified, mule deer likely account for many of these accidents which are most often fatal to the deer. Other accidental deaths such as entanglement in fences are reported, but total numbers are unknown.

2.1.4.6 Hunting

The previous five mortality factors can be included under the term "natural mortality" where there is no intent by humans to remove deer from the population. Hunting involves the sustained removal of mule deer from the population annually.

2.1.5 Habitat Requirements and Annual Movements

2.1.5.1 Food

The species of plants used for food by mule deer vary by season and geographic location in Alberta (Bouckhout 1972; Rhude and Hall 1978; Geist 1981; Berg 1983). Bouckhout (1972) mentioned cow parsnip (*Heracleum lanatum*), creeping thistle (*Cirsium arvense*), false hellebore (*Veratrum eschscholtzii*) and balsam-root (*Balsamorhiza sagittata*) as frequently eaten fall and early winter foods in Waterton Lakes National Park, Alberta. Geist (1981) mentioned the same plants as Bouckhout plus various composites, willows (*Salix* spp.), prickly rose (*Rosa acicularis*), saskatoon (*Amelanchier alnifolia*), red osier (*Cornus stolonifera*) and choke cherry (*Prunus virginiana*) as important fall and early winter foods in the same area. Both authors indicated that Douglas fir (*Pseudotsuga menziesii*) is an important mid- to late winter food as did Berg (1983) who worked in the Porcupine Hills in Alberta. Rhude and Hall (1978) list snowberry (*Symphoricarpos albus*), silverberry (*Elaeagnus commutata*), aspen (*Populus tremuloides*), prickly rose, creeping juniper (*Juniperus horizontalis*), choke cherry, asters (*Aster* spp.), and pasture sagewort (*Artemisia frigida*) as important winter foods in Camp Wainwright, Alberta. Grasses and many forbs were evident in the winter diets but became increasingly important in the spring (Bouckhout 1972; Rhude and Hall 1978; Geist 1981). Agricultural crops such as alfalfa (*Medicago sativa*), winter wheat (*Triticum* sp.), fall rye

(Secale cereale), oats (Avena sativa) and garden produce are also eaten by mule deer (District Occurrence Reports, 1983-1985, Fish and Wildlife Division).

2.1.5.2 Cover

Cover includes a security component (i.e., it allows hiding and escape from predators and provides a visual and auditory buffer from human disturbance) and a thermal protection component (i.e., it reduces effects of heat in summer and cold in winter) and may allow more freedom of movement in winter. Black et al. (1976) determined that, for forested areas in Oregon, coniferous trees or deciduous trees and shrubs approximately 1.5 m tall with 75 percent crown closure satisfy thermal cover requirements. Bouckhout (1972), Geist (1981) and Berg (1983) indicated that Douglas fir is an important winter cover type in the foothills and mountains of southwestern Alberta. In parkland and prairie habitats in Alberta, mule deer use rugged terrain, wooded river valleys and shrubby draws for cover (Regional Biologists, Alberta Fish and Wildlife, pers. comm.). Regarding use of the boreal mixedwood, Telfer (1978) stated that mule deer were occupying steep, south-facing slopes of major drainages such as the Berland, Wildhay and Athabasca rivers in winter.

2.1.5.3 Movements

Movements in winter, to better thermal cover in combination with more accessible food resources, are highly variable. Bouckhout (1972) and Geist (1981) observed that mule deer in southwestern Alberta adjusted their winter location constantly (e.g., moved up from the valley to the Douglas fir zone during deep snow and cold temperatures) to locations that provided adequate thermal cover with minimal snow cover, the latter allowing freedom of movement and access to food. Geist (1981) stated that in spring the deer moved to treeless prairie hills to feed, away from aspen bluffs and conifers where snow remained deep and hard. Many of the prairie and parkland mule deer move into the major drainages of the Red Deer, Bow and South Saskatchewan rivers in winter (Regional Biologists, Alberta Fish and Wildlife, pers. comm.). In the mountains mule deer move from higher elevations to lower

south-facing slopes to escape high snowfall and reach more accessible food resources (Regional Biologists, Alberta Fish and Wildlife, pers. comm.).

2.2 Description of Deer Management Areas

The main geographic reference used for wildlife management in Alberta is the Wildlife Management Unit (WMU); there are currently 157 WMUs in Alberta (Figure 2). Each of the nine Deer Management Areas (DMAs) represent a group of WMUs having similar mule deer population characteristics and similar levels of recreational use. The DMAs (Figure 2) are similar to the wildlife habitat regions of Alberta (Figure 3) which reflect both wildlife habitat and general land use patterns. The general characteristics of each of the nine DMAs are summarized in Table 2. A more detailed description of current status of each DMA appears in Section 2.4.2.

2.3 Historical Status, Use and Management of Mule Deer in Alberta

This section provides a brief look at the historical status of mule deer populations and how people used these populations. It also outlines the evolution of mule deer management programs leading to the current program outlined in Section 2.4.

2.3.1 Historical Status of Mule Deer Populations and Habitat

2.3.1.1 Populations

Dwyer (1969) outlined several reports of mule deer by various travellers and naturalists throughout Alberta in the 1800s and 1900s. Dwyer (1969) and Webb (1959) both mentioned declines of mule deer populations in the late 1800s and Dwyer (1969) stated that severe hunting pressure (associated with European settlement) and a series of severe winters were the cause. After 1900, mule deer populations increased despite temporary setbacks and pushed northward into formerly unoccupied range (Webb 1959). This view was supported by the 1909 Annual Report of the Department of Agriculture that indicated mule deer were reasonably

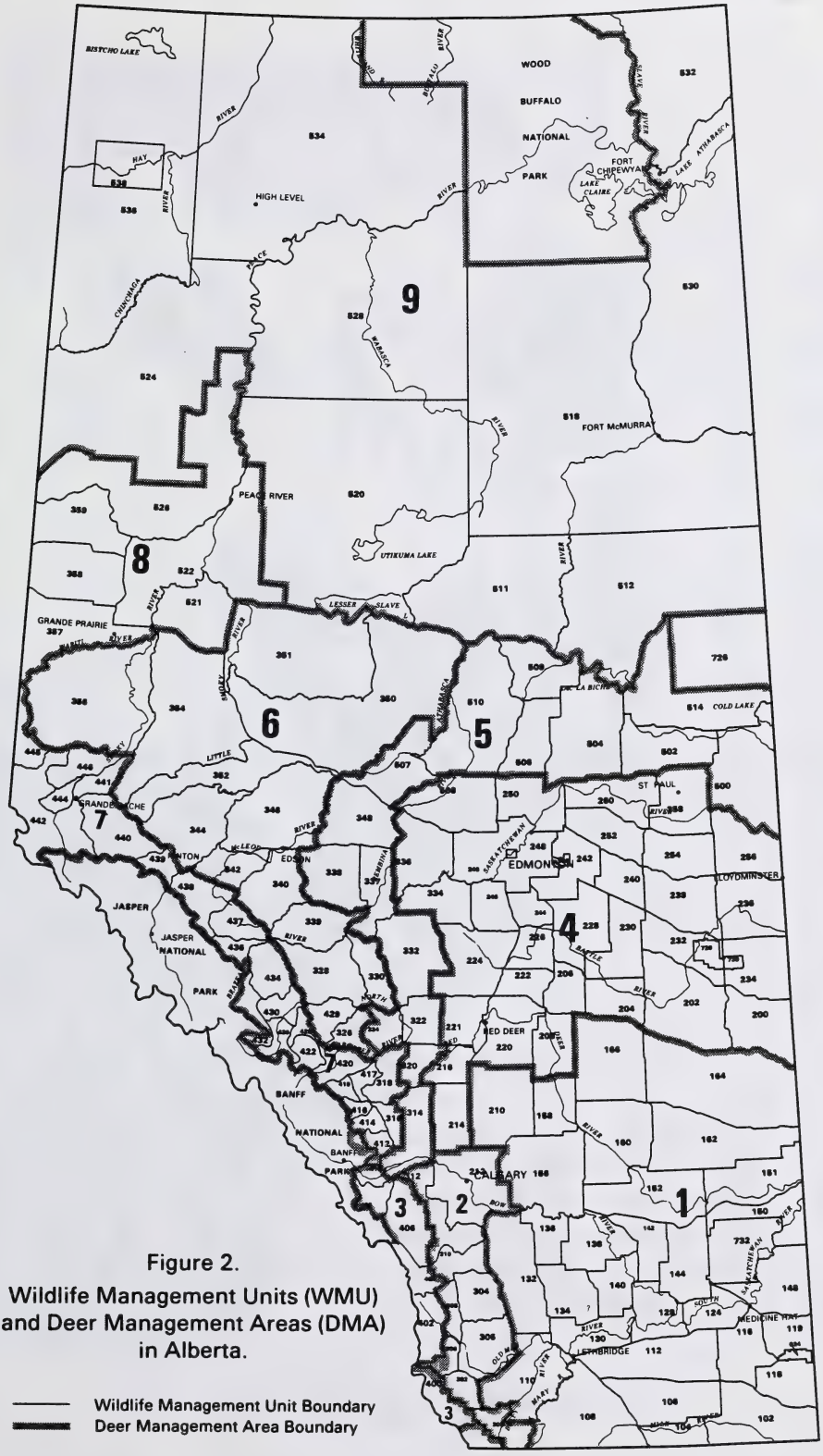

Figure 2.
Wildlife Management Units (WMU) and Deer Management Areas (DMA) in Alberta.

Wildlife Management Unit Boundary
Deer Management Area Boundary

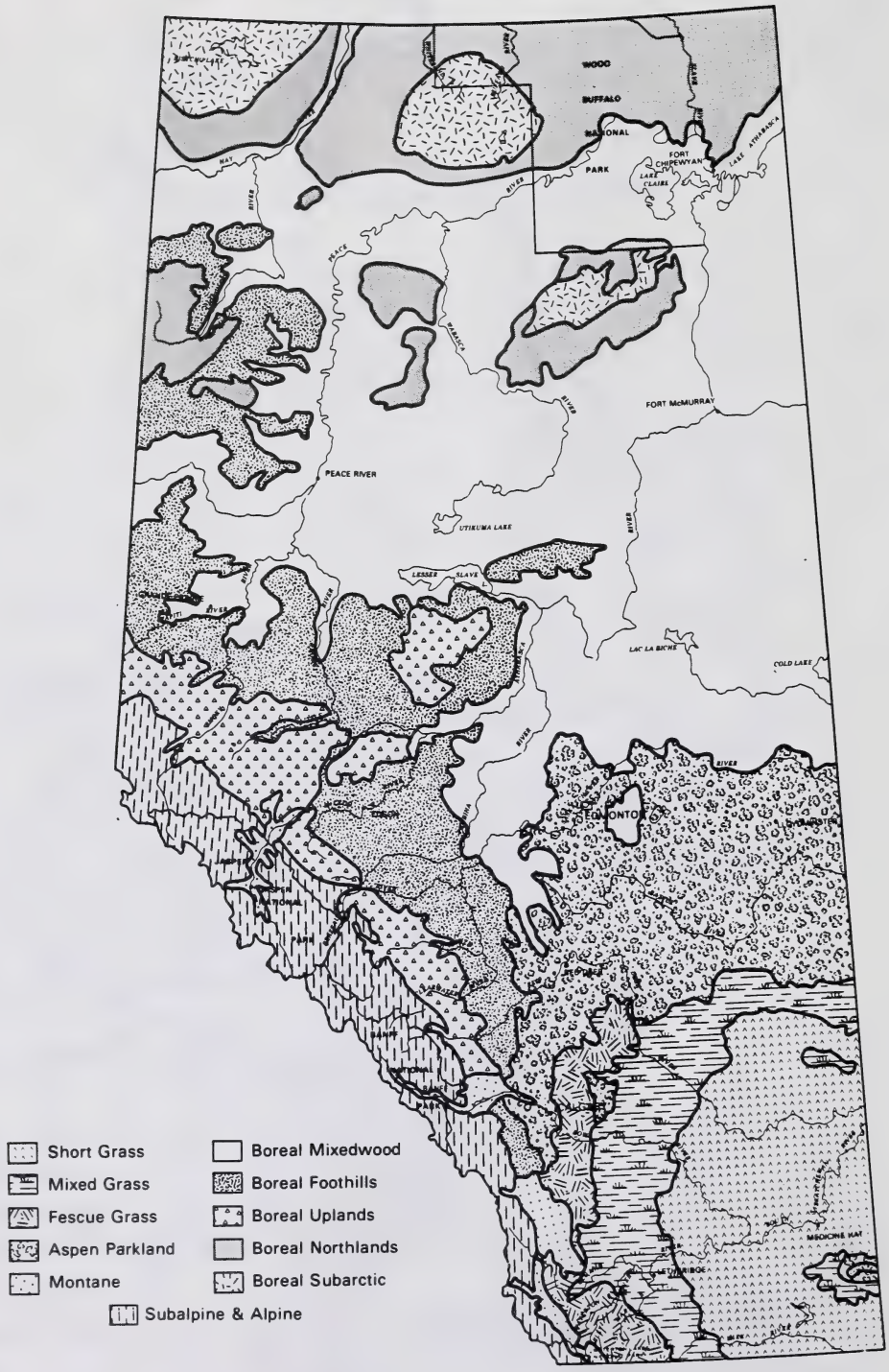

Figure 3. Wildlife habitat regions of Alberta.
(Source: Pedocan 1984)

Table 2. General characteristics of the nine Deer Management Areas in Alberta in 1986.

Deer Management Area	Percent of Provincial Mule Deer Population	Mule Deer Productivity[a]	Vehicular Access to Mule Deer Habitat[b]	Hunting Pressure[c]	Status of Mule Deer Habitat[d]	Percent of Area Under Private Ownership
1	31	high	high	high	stable	73
2	19	high	moderate	high	stable	84
3	11	low	moderate	moderate	stable	14
4	9	moderate	high	high	decreasing	92
5	6	low	moderate	moderate	decreasing	40
6	8	low	moderate	high	changing	11
7	4	low	moderate	low	changing	11
8	7	low	moderate	moderate	changing	47
9	5	low	low	low	stable	6

[a]Productivity refers to the harvestable surplus of antlerless animals as a percentage of the total estimated population in the deer management area. High is 7%-12% of the population, moderate is 3%-6% and low is 0%-2%.

[b]Vehicular access reflects the degree of development of roads and other useable surface access such as seismic lines. High means a road grid and/or other access is developed in most of the townships in the area, moderate means about half the area has good access and low means most of area does not have good access.

[c]Hunting pressure refers to the number of hunter days spent in the management area during one hunting season. High is more than 30 000 hunter days, moderate is 10 000 to 30 000 hunter days and low is fewer than 10 000 hunter days.

[d]Habitat status refers to the habitat trend in the management area. Stable means the existing habitat is quite secure, decreasing means that there is a net loss of habitat each year and changing means that while habitat is decreasing in one part of the management area, it is improving in another part of the same management area.

plentiful in almost every section of the province. However, their distribution was changing as evidenced by a comment in the 1934 Annual Report of the Department of Agriculture that mule deer were common in the mountainous and foothill sections but not in farming areas.

Population assessments of mule deer before the 1950s were based on population estimates submitted by Fish and Game and Forestry Officers and data from licence returns and questionnaires (Webb 1959); there were no systematic inventories for that period. Systematic counts of ungulates began in 1954 and the first deer surveys in 1957 with the beginning of the parkland and prairie aerial deer surveys that have continued until the present. On the basis of these limited early surveys and data on the deer harvest, Webb (1959) estimated the Alberta mule deer population to be 175 000 in 1959. At the same time he estimated 90 000 white-tailed deer and said that they far outnumbered the mule deer in the eastern parklands. Burgess (1973) suggested that during the 1950s mule deer increased in northern areas but decreased in the southern parkland and prairies. He also suggested there was a downward trend in central Alberta mule deer herds in the 1960s and early 1970s. Bruns (1979) indicated that the severe winters of 1964-65, 1968-69 and 1973-74 combined with some liberal hunting seasons (e.g., open doe seasons) during the 1960s kept mule deer densities quite low.

The population estimate in the early 1970s for both deer species combined was 150 000 (Alberta Fish and Wildlife 1974), well below Webb's 1959 estimate of 265 000. Using the 1983 white-tailed deer:mule deer ratio of 62:38, the early 1970s population would have included about 57 000 mule deer. The severe winter of 1973-74 was followed by 10 relatively mild winters over most of Alberta and mule deer populations increased, particularly along prairie rivers where some populations doubled or tripled. The 1983 winter population estimate was 73 000 mule deer. Drought, a severe winter during 1984-85 and an intentional herd reduction (to decrease crop damage) in some WMUs in DMAs 1, 2 and 4 in 1984 and 1985 reduced the provincial herd to an estimated 64 000 mule deer during the winter of 1985-86. Estimates in DMAs 1, 2 and 4 and some WMUs in DMAs 3, 5, 6 and 8 are based on aerial survey and habitat data. Estimates in most of DMAs 3, 5, 6, 8 and 9 are quite rough because data are limited by lack of practical inventory techniques.

White-tailed deer were also present in the latter part of the 1800s, but overall numbers were lower than for mule deer and distribution was limited to the southeastern and southern foothills portions of Alberta (Webb 1967). White-tailed deer also suffered tremendous declines during the last two decades of the 1880s due to several severe winters combined with heavier hunting pressure that followed the extinction of bison and severe reduction in elk populations. The 1909 Annual Report of the Department of Agriculture mentioned that the white-tailed deer was practically extinct in Alberta. Since then their population expanded northward and westward and increased continually, reaching an estimated 90 000 by 1959 (Webb 1959, 1967).

Kramer (1971) suggested that mule deer were better adapted to cope with severe winter, but white-tailed deer were preadapted to survive during agricultural development because of the way they used patches of cover for hiding. Much of the open range formerly used by mule deer has been converted to farmland. The result was decreased mule deer populations and increased white-tailed deer populations over much of agricultural Alberta, including the Peace River country. More recently, expansions of white-tailed deer populations have likely resulted from openings created by industrial activity and a series of mild winters. Both mule deer and white-tailed deer occur in every WMU in Alberta today, though populations are very limited in distribution and numbers in WMUs 532-538 (Regional Biologists, Alberta Fish and Wildlife, pers. comm.). Details of the 1985 white-tailed and mule deer populations appear in Section 2.4.1.

2.3.1.2 Habitat

There are no quantitative historical assessments of changes in mule deer habitat but some general trends are apparent. Mule deer favour open habitats often associated with rugged terrain, south- and west-facing slopes of the foothills, mountains and riparian areas, and early seral stages caused by fire or mechanical disturbance in forests.

Many of these same types of open habitats were attractive to early settlers because little clearing or improvement was required before cultivation or grazing could commence. Agricultural expansion was extremely rapid after 1900 with 168 355 ha (416 000 ac.) under

cultivation in 1905 increasing to 20.03 million ha (49.5 million ac.) by 1976 (Thompson 1981). There was also a dramatic increase in cattle from around 1 million in the early 1900s to over 4 million in the 1970s (Thompson 1981). Cultivation reduced the amount of open habitat available and cattle grazing reduced the quality of many local habitats by competing with deer for forage and also by physically damaging both forage and cover. The effect of this habitat degradation and removal is not quantified, but it would have been considerable.

Vigorous forest fire suppression in recent decades has allowed forest succession to close in and reduce many mule deer ranges that were formerly maintained by natural fires. At the same time some types of agricultural development, timber harvesting, and other land surface disturbances have opened up the forest canopy in some areas creating improved habitat conditions for mule deer. Mule deer often take advantage of agricultural products (e.g., alfalfa) to supplement their annual food supply. The net effect has been a significant reduction in mule deer habitat during this century, but future management of habitat in timber harvesting areas and careful range management in agricultural areas may offset some of these losses.

2.3.2 Historical Uses of Mule Deer in Alberta

2.3.2.1 Demand for Consumptive and Nonconsumptive Use

Mule deer provided an important source of food and clothing material during the early settlement and development of Alberta. Their importance increased with the demise of the bison and the severe decrease in elk populations during the latter half of the 1800s. Their value as essential food slowly diminished in the 1900s and they became more valuable as a source of both consumptive and nonconsumptive recreation. However, they still provide a supplemental source of meat for many Albertans today. The nonconsumptive demand for mule deer was not measured until recently (Phillips et al. 1977; Filion et al. 1983), but licence sales were recorded for many years, providing one form of measuring the consumptive or hunting demand.

Table 3 summarizes resident and non-resident licence sales for mule deer hunters in Alberta at intervals between 1907 and 1985. The data

Table 3. Resident and non-resident licence sales for mule deer hunting in Alberta.

Year	Resident Big Game[a]	Resident Mule Deer	Non-resident Big Game/Mule Deer
1907	446	NA[b]	NA
1910	1 997	NA	NA
1915	912	NA	NA
1921	1 138	NA	NA
1925	5 734	NA	NA
1930	8 266	NA	NA
1935	5 948	NA	NA
1941	6 785	NA	169
1945	9 881	NA	188
1951	14 340	NA	192
1955	24 858	NA	217
1960	62 116	NA	282
1965	NA	31 638	625
1970	NA	29 317	83
1975	NA	26 842	138
1980	NA	54 528	282
1985	NA	62 032	494

[a]A resident big game licence was required to hunt mule deer up to and including 1962. There was both a mule deer and a big game licence during 1963 and 1964 allowing one deer with each licence. From 1965 onward a mule deer licence was required and the big game licence was dropped. The big game licence also applied to moose, elk, caribou and white-tailed deer so it was not exclusive to mule deer.

[b]NA means "not applicable" under the first two columns and "not available" under column three.

from before 1955 must be treated with caution because people were allowed to hunt deer for subsistence purposes without a licence in many areas. Many people were also of the opinion that they did not really need a licence to hunt deer; enforcement of game laws was nonexistent in many areas so licence sales represent only a portion of the demand. With the advent of a professional fish and wildlife enforcement and management staff in the 1950s, compliance with the law increased and licence sales more closely reflected demand.

Non-resident hunting licence sales during the last 45 years (Table 3) have increased, but the total number is still under 500 and represents less than 1 percent of the mule deer hunters in Alberta today.

2.3.2.2 Mule Deer Hunting Seasons and Bag Limits

Historically, mule deer hunting seasons and bag limits have been used to control the harvest. More recently, seasons have been arranged to occur after the fall agricultural harvest and before the onset of severe winter conditions to reduce hunter/landowner conflicts and to reduce winter stress on the deer herd.

The first restriction on season length occurred in 1883 when the Game Ordinances of the Northwest Territories prohibited the hunting of big game, including mule deer, between February 1 and September 1 each year. There was no mention of bag limits at this time. An 1893 Game Ordinance said that the season was closed from February 1 to October 1 and that hunters were limited to six head of each species; no limit applied when the purpose was food for hunters and their families. Bag limits on the deer family were three of each species in 1899. Sunday hunting was prohibited in 1903, as was the taking of females or young. By 1913 the bag limit had been reduced to one male deer of either species during a province-wide six-week season.

This pattern continued with minor variations in dates until 1929 when the first type of zoning began and the deer season was closed east of Highway 2 and south of the North Saskatchewan River. This closure remained until 1948 when the season was opened province-wide again, but the bag limit became more restricted as only one moose or one elk or one deer could be taken. The closure east of Highway 2 and south of the

North Saskatchewan River returned in 1950 and 1951. In 1952 part of the closed area was opened again. The deer season was closed province-wide during 1953 and 1954. Bag limits continued at one only of the remaining members of the deer family.

The deer season reopened in 1955 with dates, open areas and bag limits similar to 1951. It has not been closed province-wide since that time. The first wildlife management biologists were hired in the early 1950s and recognized different ecological zones and the relative vulnerability of game in different areas. Big Game Zones (BGZs) were developed to reflect both ecological zones and species vulnerability to hunting. There were six BGZs in 1956, 10 in 1957 and 22 from 1958 to 1963. Seasons were quite variable between zones. In 1964 Wildlife Management Units (WMUs) were created and used to set seasons. BGZs appeared again in 1967 with 13 and 1968 with 14. There have been 15 or 16 BGZs since 1968 with six major shifts in zone boundaries during that period. Zones and WMUs were used to manage the deer herds on a more local basis by controlling, as needed, the harvest in a particular area. Since Big Game Zones are designed for all big game species, many do not apply to mule deer; Deer Management Areas (DMAs) were developed for this plan to focus on the management of mule deer.

Seasons for every third year between 1943 and 1985 are shown in Figure 4. In cases where there was more than one season in the DMA, the longer season was used. Some of the more significant highlights of the 1957-1985 period are as follows:

1957 - A female mule deer season, the first since 1903, was opened in part of the province, but the bag limit remained at one member of the deer family. The "bow hunting only" Canmore corridor was created.

1963-64 - There was a male mule deer licence (good in a specified area) in addition to the big game licence, which was still good for only one member of the deer family.

1965 - A mule deer licence was the only licence for mule deer. There was also a white-tailed deer licence.

1966 - Special Camp Wainwright Deer Season was instituted, allowing extra mule deer to be taken.

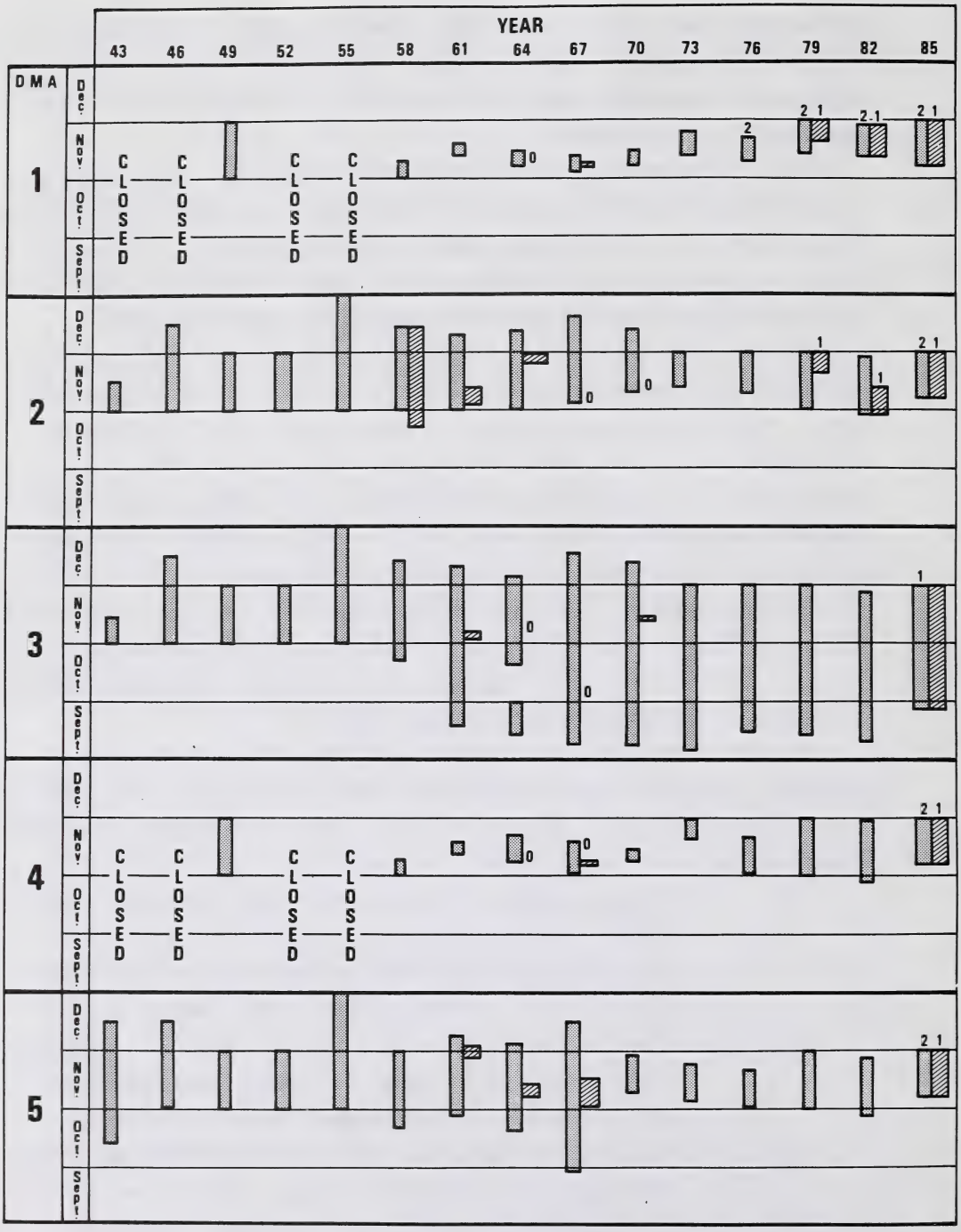

Figure 4. Mule deer hunting seasons, 1943-1985.
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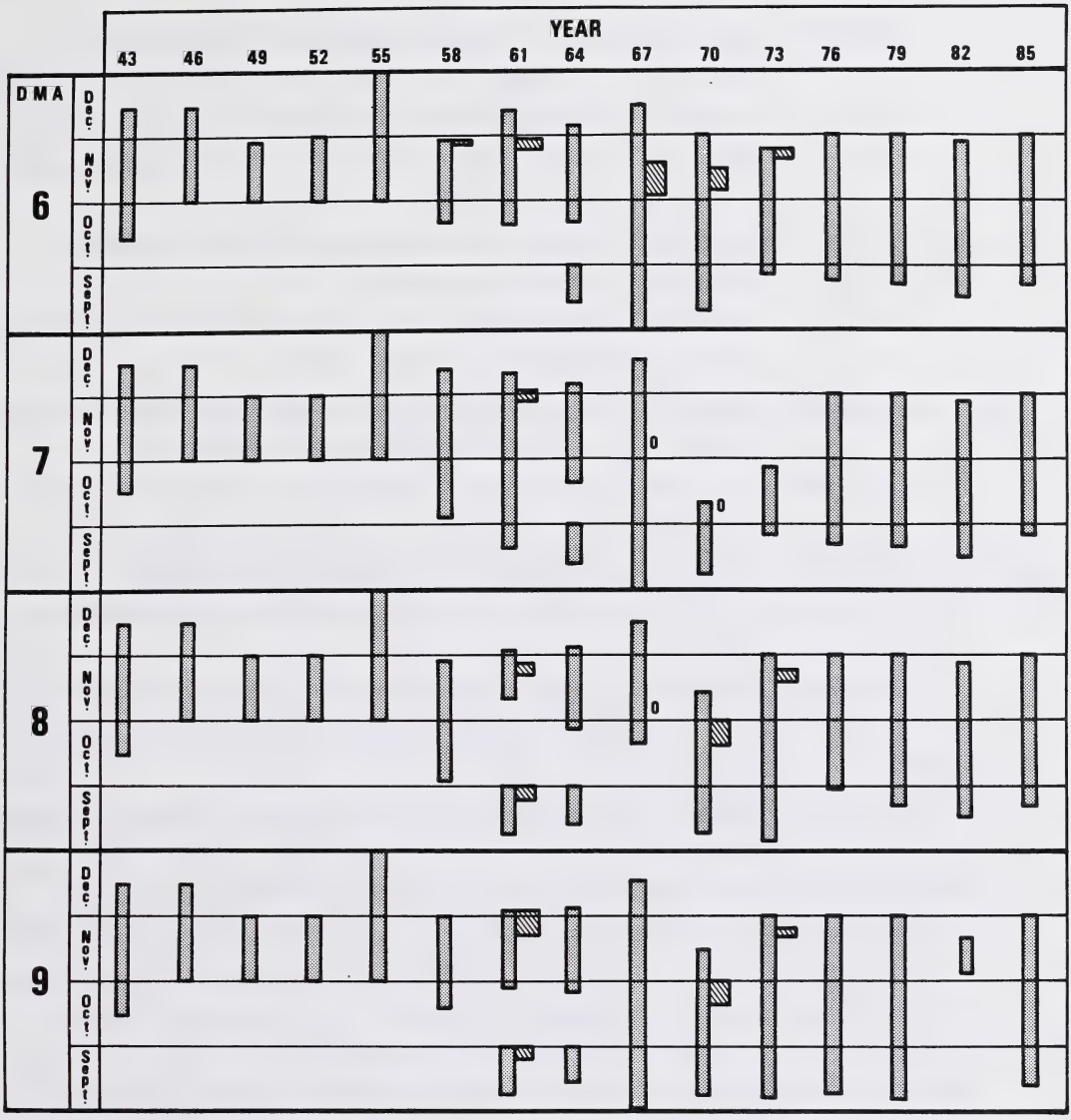

LEGEND

DMA	Deer Management Area
1	Hunting only with an authorization or special licence
2	Hunting restricted to a 4-point buck
0	One day antlerless season

antlered
antlerless

Figure 4. (Continued)

1968-77 - In part of DMA 1 the male mule deer licence was only good for a "trophy" animal (at least four points on one antler in addition to the brow tine). The geographic area was expanded over the years. The season remained up to and including 1977.

1969 - Sunday hunting was permitted again in the northern unsettled portion of Alberta.

1970-71 - There was a MED (moose, elk, deer) licence that could be used instead of the species licence.

1974-76 - The antlerless mule deer season was closed province-wide except for the "bow hunting only" zones.

1977-85 - All antlerless mule deer hunting was controlled using a draw for either a special licence or authorization.

1978-85 - The trophy mule deer was reduced from a 4-point to a 3-point and the name trophy was eventually dropped in 1981.

1980-85 - A special trophy zone was created where hunting of male deer was controlled by a draw, plus the buck had to be a 3-point.

Mule deer harvests, especially antlerless animals, began to exceed acceptable levels in DMAs 1, 2, 3 and 4 in the mid- to late 1960s in spite of very short open seasons (e.g., one-day antlerless seasons). To stop the excessive harvest, male harvests were controlled by size restrictions (e.g., 4-point and 3-point rules) and female harvests were controlled by limiting the number of hunters in a WMU using a draw system. There was usually only one mule deer tag, but additional tags were supplied at various times over the years for the antlerless seasons, so the bag has varied from one to four mule deer per year over the past 30 years. Seasons have been shorter in settled areas, both to control the deer harvest and reduce hunter/landowner conflict, and longer in unsettled areas where the deer were considered less vulnerable and hunters experienced little conflict with other users.

2.3.2.3 Mule Deer Harvests

In Alberta, the mule deer harvest has increased steadily between 1910 and 1985 (Table 4), as has the human population and the number of

Table 4. Estimated Alberta mule deer harvest by licenced hunters for a few selected years from 1910 to 1985.

Year	Number of Licences	Estimated Harvest	Hunter Success Rate[a]
1910	1 997	540	27
1930	8 266	2 931	35
1965	31 638	7 500	24
1975	26 842	5 097	19
1979	54 528	13 000	24
1984	61 662	15 897	26
1985	62 032	17 836	29

[a]Based on the number of licences sold.

hunters. The effect of a closed antlerless season (e.g., 1975) is a reduced harvest and lower success rate. Recent high levels of harvest in 1984 and 1985 reflect the high numbers of deer resulting from 10 years of modest population growth. The high numbers of deer are also reflected in the higher hunter success rate.

Before 1957 only male deer could be hunted, and a strong hunter ethic has persisted against shooting females or fawns; as a consequence, the bulk of the harvest was males until recent years. With the understanding that an antlerless harvest is part of good herd management, the female harvest has increased until 1985 when it was just under 50 percent of the harvest. Mule deer fawns have consistently made up less than 17 percent of the antlerless harvest (Triechel 1977-1985) because hunters usually have time to select the larger doe (Wishart 1986).

2.3.3 The History of Mule Deer Management in Alberta

2.3.3.1 Managing Hunter Harvest

Management consists of knowing how many animals there are in the herd and where they are, understanding the factors that control natality and mortality (climate, predation, disease, competition, habitat quality, hunting), and manipulating those factors to provide the desired results.

There were few extensive, quantitative counts of deer before those done by the first wildlife biologists in the province in the mid-1950s. Before that, the question of population size was based on isolated counts and the subjective assessment of many people, including farmers, forestry staff and game guardians, who provided trends over the years. The only factors that were managed were predation and hunting.

There were no predator control programs aimed at increasing deer populations, but predators were trapped, shot and poisoned to control health hazards such as rabies and to reduce livestock depredation (Gurba and Neave 1979). Todd and Geisbrecht (1979) mention very high coyote harvests between 1920 and 1978 with a peak of nearly 57 000 pelts marketed in Alberta in 1925-26. There are no data on the effect of these programs on mule deer, but they likely benefited some populations.

The first controls on hunting harvests involved season lengths as

discussed previously. This was followed very quickly by bag limit restrictions. The next restriction was to limit the bag to a combination of species for which a hunter could hunt (e.g., 1949 - hunter could harvest one male only, either a deer, a moose or an elk). Geographic separation of seasons began as early as 1929 when part of the province was closed to deer hunting. This concept was greatly expanded in the 1950s with the advent of Big Game Zones. Wildlife Management Units, introduced in 1964, have been used to limit the number of hunters in an area through a draw and provide an opportunity to manage the deer harvest at a more local level.

Hunter density controls, authorizations and special licences, were necessary when bag limit and season length did not result in adequate harvest management. An "authorization" offers an additional opportunity to hunt the animal specified (e.g., antlerless mule deer) in a particular WMU during the open season, but there is still only one tag. The second technique involves the issue of a "special licence" which provides a second tag to hunt a specified animal (e.g., antlerless mule deer) in a particular WMU during the open season. A variation of the latter licence also has specified dates when it is valid (e.g., Camp Wainwright Deer Licence). In regard to male mule deer, restricting the harvest to a particular size of animal (e.g., 3-point male) will also control the harvest.

The various methods used to control hunting harvest have evolved to maintain the deer population within certain levels, to maintain a quality hunting experience (low hunter density and reasonable chance to harvest a deer), and to provide hunting opportunities on private land with minimal disturbance to the landowner. Table 5 summarizes the methods used and indicates when they were first applied in Alberta.

2.3.3.2 Hunter Harvest and Population Inventory

Harvest data (location, date and age/sex of kill) and population counts (inventory) are used to monitor changes in the population over time. Harvest data can be collected through licence returns, questionnaires, check stations and collection of animal parts, like jaws for aging and reproductive organs for determining potential fawn production. Population inventory can be done by directly observing the animals

Table 5. Summary of different methods used to regulate hunter harvest of mule deer.

Harvest Control Method	Time of First Use	What It Is Designed to Accomplish
Season Length	1883	Shorter season generally reduces the harvest.
Season Timing	1883	Determined on the basis of the animal's life cycle, climate or land use (e.g., rut hunt increases harvest as the animals are more mobile).
Bag Limit	1893	Sets the individual and total harvest levels.
Species Bag Limit	1949	Inclusion of several species under one licence (tag) reduces the harvest in each species.
Species Licence Combinations	1960	Restricts hunters to certain licence combinations and reduces the hunting pressure on each species in the list of choices.
Age/Sex Restriction	1903	Determines what segment of the population hunters can harvest and may specify size (e.g., 3-point male mule deer).
Zonation	1929	Allows different seasons, bag limits and age/sex restrictions to be assigned at more local levels - the first breakdown is big game zones.
WMUs	1964	Refined big game zones further into smaller areas (Wildlife Management Units).
Weapons Restriction	1957	Can be used for safety reasons or to reduce overall harvest (e.g., bow hunting only).
Limited Entry for Deer	1977	Limits the harvest to a particular goal and keeps hunter densities at levels that maintain a quality hunt and minimize landowner disturbance.

through ground counts or aerial surveys or indirectly by counting pellet groups or assessing browse condition.

There was a compulsory licence return between 1907 and 1955 which was used to indicate when, where and what was killed. Its value was limited because there was little effort to enforce compliance or to determine accuracy of the data; furthermore, deer were often harvested for subsistence use without a licence.

Webb (1959) indicated the first mail-out questionnaires regarding hunter effort and harvest were distributed by Dr. William Rowan in the 1940s. Check stations began in the 1950s and their use expanded into the 1960s. Personal contact allowed the collection of more accurate information on hunter activities. In addition, animals could be measured and jaws collected for aging. There are still a few check stations today for special hunts, but the large number of hunters and the proliferation of road access made check stations less practical by the late 1960s. There was a mule deer crest program during 1969-1972 when hunters were asked to send in jaws and complete questionnaires in return for a crest. There have been several general licence questionnaires in 1974-1979, 1984 and 1985 that included mule deer, as well as questionnaires specific to the special antlered and antlerless draws for mule deer. Jaws have been collected with varying degrees of intensity since the hunter mail-in incisor bar program began in 1977. Reproductive tracts have been collected and assessed at Camp Wainwright and through periodic road-kill carcass collections. The intent of all these activities has been to determine the size of the annual harvest and to gain information on the age composition and productivity of the population.

Although pellet group counts and browse condition have been used in Alberta for localized indices of deer abundance or habitat use (e.g., Telfer 1978), these are not practical methods of inventory because manpower requirements are too high. Before the 1950s, surveys were counts or population estimates done by forestry officers and fish and game officers. Systematic counts of deer began with the first aerial surveys in 1957. These surveys have been constantly refined and continue to be the major deer inventory method used today. Combined with harvest data, survey data can be used to develop simple population

models useful for management. Aerial surveys for deer are not feasible over most of DMAs 3, 5, 6, 7, 8 and 9 because coniferous forest types significantly reduce visibility. Low levels of harvest and hunting pressure in the past meant there was little need for population information in these DMAs, but pressure is increasing and new techniques will be required in the future.

2.3.3.3 Habitat Protection and Development

Habitat has long been recognized as the key to a healthy deer herd, but specific efforts at habitat retention and development became more focused after the creation of a Wildlife Habitat Unit in 1971 within the Alberta Fish and Wildlife Division.

Protection efforts have slowly expanded since 1971 until the present, at which time the Division has input into all major land surface and water development activities in the province, both through long-range planning (e.g., Regional Planning Commission Plans for private land and Integrated Resource Plans on public land) and day-to-day referrals. There has also been formal recognition of the need for a province-wide comprehensive habitat inventory which resulted in the formation of a Wildlife Habitat Inventory Unit in 1981. This unit has completed a 1:1 000 000 map scale inventory and current habitat suitability assessment for mule deer and is currently refining the process for the 1:250 000 map scale. Regional wildlife biologists have also been conducting deer habitat inventory and assessment programs since the early 1970s.

In 1973 the "Buck for Wildlife" fund for habitat development was initiated, beginning at $1 from each Wildlife Certificate sale and increasing over the years to $5 in 1985. This fund has been used to rehabilitate and enhance wildlife habitat generally. Although few projects were specifically targeted for deer, about 40 projects involving in excess of 9000 ha have benefited local deer herds (Alberta Fish and Wildlife 1986).

2.4 Current Status, Use and Management of Mule Deer

The previous section outlines what is known about the historical

status and use of mule deer populations and habitat and how they have changed up to 1985. It also discusses the development of mule deer management during the same period. The purpose of this section is to provide a more detailed description of the current status of mule deer populations and habitat, the present level and distribution of people's use of the resource and the present management program.

2.4.1 Current Status of Mule Deer Populations in Alberta

The estimated mule deer population in Alberta in February 1986 was 63 550. Table 6 displays the population estimates by DMA and also provides estimates for white-tailed deer as a comparison.

The population estimates for deer in DMAs 1, 2 and 4 are based on an analysis of recent aerial surveys or habitat capability maps or a combination of both. Forty-two of the 71 WMUs in these DMAs have been censused by aerial surveys. The 29 WMUs that have not been censused have either poor quality habitat or are difficult to survey due to terrain or coniferous timber that reduce deer visibility. Habitat capability maps have been completed for 14 of the 29 non-surveyed units. The precision target for most aerial deer surveys is plus or minus 30 percent.

Some deer information has been collected during other ungulate surveys in 33 of the 77 WMUs in DMAs 3, 5, 6, 7, 8 and 9; two of the remaining WMUs have regularly scheduled deer surveys. The survey data provided information on distribution and some localized densities. Habitat capability maps for deer are not available for most of western and northern Alberta, but maps for other species, such as moose and elk, cover part of this area and average deer densities extrapolated over large tracts have been used to generate population estimates. The main reason deer surveys are not flown in most WMUs in these DMAs is poor deer visibility due to terrain and extensive coniferous tree cover.

Deer population estimates for Camp Wainwright, Canadian Forces Base Suffield and Cypress Hills Provincial Park are also based on aerial surveys.

The current provincial mule deer population estimate of 63 550 is lower than the 1980 estimate of 73 000 (Alberta Fish and Wildlife 1984). This is partly due to more conservative population estimation techniques

Table 6. Estimated mule deer and white-tailed deer populations by Deer Management Area in Alberta in February 1986.

Deer Management Area	Estimated Numbers			
	Mule Deer	% Provincial	White-tailed Deer	% Provincial
1	19 450	31	15 900	19
2	11 850	19	4 300	5
3	6 800	11	3 550	4
4	5 700	9	28 800	35
5	3 700	6	19 700	24
6	5 050	8	1 150	2
7	2 150	3	800	1
8	4 000	6	2 500	3
9	3 350	5	3 350	4
Camp Wainwright	100	<1	1 500	2
Canadian Forces Base Suffield	1 000	2	400	<1
Cypress Hills Park	400	<1	100	<1
Totals[a]	63 550	100	82 050	100

[a]Does not include National Parks or the Cold Lake Air Weapons Range.

in non-surveyed areas, but also reflects a lower population after two severe drought years (1984 and 1985), the severe winter of 1984/85 and intentional population reductions in southern Alberta in 1984 and 1985.

Figure 5 depicts the relative contribution of each WMU to the provincial mule deer herd and provides a good indication of current distribution and abundance.

2.4.2 Current Status of Land Use, Land Ownership and Mule Deer Habitat

2.4.2.1 Deer Management Area 1

Deer Management Area 1, a grassland habitat (Figures 2 and 3), is dominated by a mixture of livestock grazing, forage crops and cereal crops with some specialty crops like corn and sugar beets in local areas. There are 13 irrigation districts in this area.

Although mule deer do well in open habitats, they are not a true grassland species and must have access to rugged terrain and shrubby draws or wooded river valleys that occur throughout the region. These localized habitats provide both food and cover necessary for winter. In the cultivated portion of this DMA, habitat is confined to creek and river valleys and other small patches of nonarable land such as hills, shores of waterbodies, and man-made areas such as railway corridors and irrigation canals. Habitat in the uncultivated grassland portion of this DMA is also localized in riparian areas or hilly locations where local moisture regimes allow the essential winter food shrubs to become established. Winter chinooks often provide easy access to forage over much of this DMA.

Public versus private land ownership is tabulated in Table 7. Most of the public land in DMA 1 has been leased for agricultural use so there is little land use distinction between the public and private land. Data for white-tailed deer in the mid-1970s showed that 66 percent of the critical range in the prairie region (similar to DMA 1) occurred on private land. Although recent figures are not available, it is expected that about 70 percent of the good mule deer habitat in DMA 1 occurs on private land.

The habitat quality, particularly of the food component, can vary

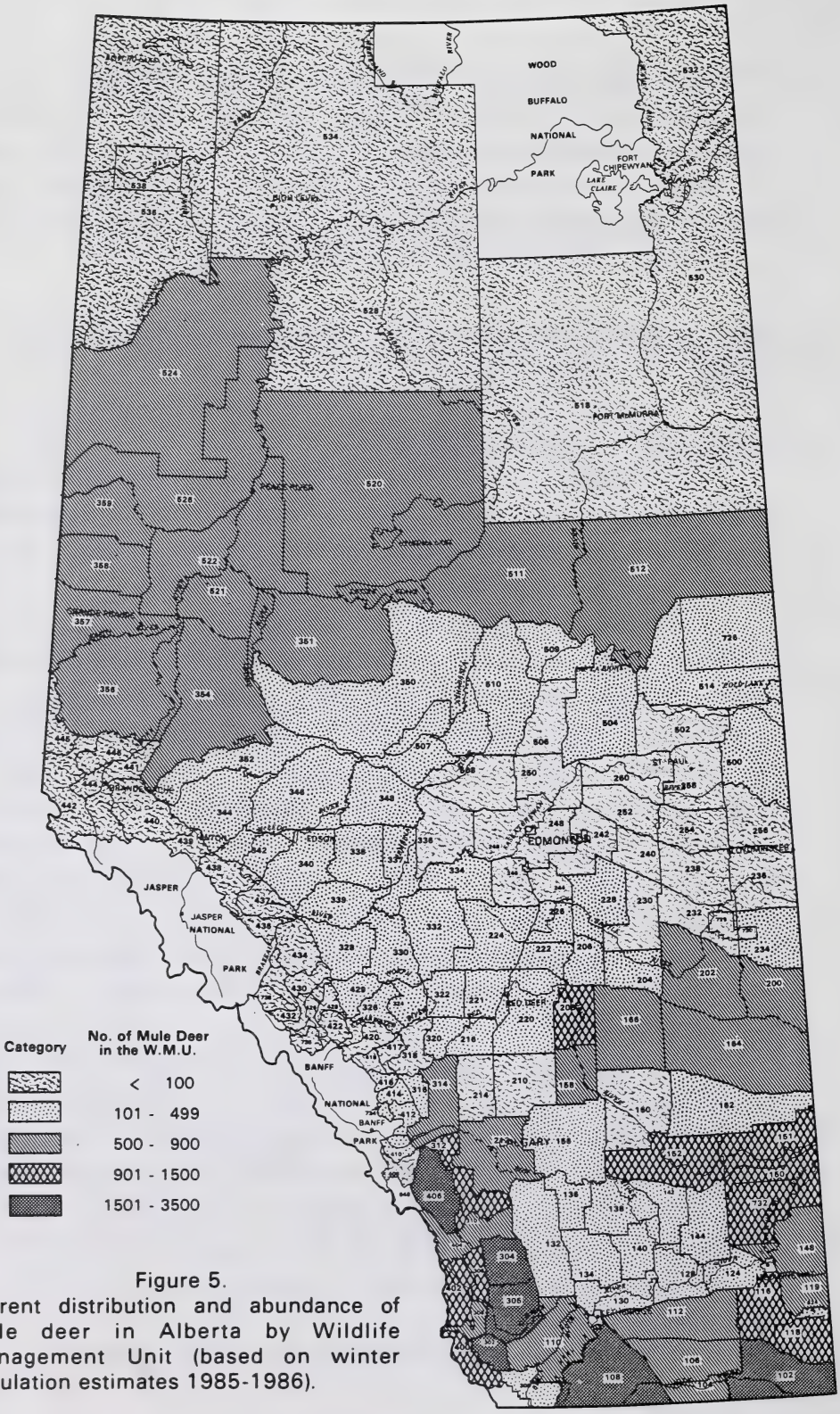

Figure 5.
Current distribution and abundance of mule deer in Alberta by Wildlife Management Unit (based on winter population estimates 1985-1986).

Table 7. Amount of public and private land in each Deer Management Area in Alberta in November 1985.

DMA	Crown Land km^2	Private Land km^2	Total km^2	% Private Land
1	21 962	60 013	81 975	73
2	1 934	10 146	12 080	84
3	6 206	997	7 203	14
4	5 947	64 288	70 235	92
5	29 617	19 699	49 316	40
6	52 275	6 213	58 488	11
7	25 167	3 234	28 401	11
8	12 737	11 308	24 045	47
9	240 348	14 565	254 913	6
TOTAL	396 193	190 463	586 656	32

Note: Numbers are estimates using information tabulated by municipality (Source: Habitat Branch of Alberta Fish and Wildlife) and adapted to the Deer Management Areas.

widely over time. Two years of severe drought in 1984 and 1985 over much of DMA 1 reduced the amount of browse and may have caused the remaining browse to be lacking in essential nutrients. Competition with livestock also increased as cattle switched to browse in the absence of adequate supplies of grasses and forbs, resulting in even less browse for deer.

The food and cover habitat in this DMA is reasonably stable because of its nonarable nature. However, the irrigation upgrading program will remove some important deer habitat and there is still conversion of shrubland and grassland to forage and other crops. Although the habitat is open and hunting pressure is very high, security from disturbance is reasonably good in most areas because of rugged riparian terrain and large landholdings with few roads.

2.4.2.2 Deer Management Area 2

Deer Management Area 2, a combination of fescue grassland, aspen parkland and mixedwood habitats (Figures 2 and 3), is dominated by cultivated farmland in the eastern portion and livestock grazing in the western portion. The cultivated farmland has small areas of mule deer habitat limited to creek valleys and other nonarable lands.

Habitat in the western portion is extensive and high quality. The mosaic of fescue grassland, aspen parkland and mixedwood stands, associated with the Porcupine Hills in the centre and other foothills to the north and south, provides an excellent mix of food and cover over much of this area. The presence of numerous south- and west-facing slopes and frequent winter chinooks also favours winter survival because of reduced snow depths and increased food availability. Some of the mule deer that spend part of the spring through fall period in DMA 3 subsequently use DMA 2 for winter range.

Private landowners own 84 percent (Table 7) of the land, thereby controlling a significant portion of the important mule deer habitat in this DMA. Most of the public land is leased and used for livestock grazing.

The food and cover in this DMA is reasonably stable. Some clearing and range improvement activities are reducing habitat in local areas but are offset by brush and aspen encroachment in other areas. Berg (1983)

investigated wild and domestic ungulate interactions in the Bob Creek area (Townships 10 and 11, Ranges 2 and 3, West of the 5th Meridian) and found a very low level of diet overlap between mule deer and cattle at current stocking rates even though their general ranges overlap significantly. Security from disturbance is also good because vehicular access is moderate to low in the western portion of this DMA where the habitat is the best. Many large landholders are effective in controlling when and how much access takes place. However, this intensifies pressure where landholdings are small and road access is good.

2.4.2.3 Deer Management Area 3

Deer Management Area 3, an area of alpine and subalpine habitats (Figures 2 and 3), has extensive areas of coniferous forest with limited suitability for mule deer. However, many of the river and creek valleys and some lower elevation slopes resemble the aspen parkland and mixedwood that are present in DMA 2 and provide suitable habitat for mule deer. Major land uses include timber harvesting, livestock grazing and a wide variety of recreational uses. The land in this DMA is mainly publicly owned (Table 7) with only 14 percent under private ownership.

The habitat base is quite stable. Food and cover lost to advancing coniferous encroachment, resulting from fire suppression, is offset by small timber-harvesting operations that open up the coniferous timber. There could be a net gain in habitat because of increased food resources created along the edge of coniferous cut blocks, but the gain is reduced by increased access that lowers the security side of the habitat component. Although vehicular access and hunting pressure are moderate, their effect is substantial because most of the access routes coincide with the best deer habitat in the major valleys. The likely result is a deer population below the capacity of the habitat.

2.4.2.4 Deer Management Area 4

Deer Management Area 4, an area of aspen parkland (Figures 2 and 3) segmented by parts of the North Saskatchewan, Battle and Red Deer rivers, is a variable mosaic of cultivated cropland, livestock pasture and clumps of aspen. Areas of better quality soil have high levels of cultivation and very little aspen forest (e.g., WMU 240) while poorer

quality soils result in a mixed farming-forest mosaic (e.g., WMU 224). A more constant winter with colder temperatures and greater snow depths on average make this DMA less productive (i.e., lower survival and recruitment) than DMAs 1 and 2, but it still has some good quality mule deer habitat. The land in this DMA is 92 percent privately owned (Table 7) and most of the public land is leased for livestock grazing.

Food and cover in this DMA are quite extensive now but are rapidly decreasing. Rippin (1981) showed that good deer habitat (areas having 35 percent or more aspen tree cover) in WMU 256 declined from 47 percent of the WMU in 1950 to 22 percent in 1980. Jaques (1980) found that clearing of aspen forest between 1970 and 1977 in the Pine Lake area of Red Deer County was proceeding at a rate that would see complete tree cover removal in 27 years. Communications with regional staff indicate that this trend is continuing throughout the DMA (Central and Northeast Regional Biologists, Alberta Fish and Wildlife, pers. comm.). Jaques (1980) indicated about 60 percent of his sample plots reflected heavy to very heavy domestic livestock grazing, which reduced the cover of the primary deer browse species to about 10 percent of what would be expected under light to moderate browsing by deer. Rhude and Hall (1978) also showed considerable diet overlap between deer and cattle because of late summer/fall browsing by cattle. This competition reduces the overwintering capability of the habitat for mule deer.

Habitat security in DMA 4 is poor because the road grid is very dense and habitat is patchy. The result is suspected high levels of illegal harvest, road kills and general harassment by people. The mule deer population appears to be below the capacity of the food and cover in many areas and continues to decrease. This vacant habitat is sometimes occupied by white-tailed deer, which are better able to tolerate human harassment. The few areas where mule deer numbers are relatively high in this DMA are along the three major rivers and in WMUs like 200 and 202 where the habitat is more continuous, access is more restricted and security is relatively high.

2.4.2.5 Deer Management Area 5

Deer Management Area 5, an area of boreal mixedwood forest (Figures 2 and 3), is a patchwork mosaic of poplar clumps, muskeg, spruce

clumps, mixed spruce/poplar stands and clearings associated with agricultural and timber harvesting land uses. Agricultural land use dominates about half the DMA, on the side bordering DMA 4, and includes both annual cultivated cropland and improved and unimproved livestock grazing in mixed farming operations. Agricultural development in DMA 5 has been expanding northward and westward. The Bow, Red Deer, North Saskatchewan, Pembina and Beaver rivers are only a small portion of the total area but have important mule deer habitat associated with them. Numerous other smaller streams and water bodies (especially in WMUs 500, 502, 504, 510 and 514) also provide a focus for important mule deer habitat.

The land base is 40 percent privately owned (Table 7). The public land has numerous livestock grazing leases. There are nine Provincial Grazing Reserves, many small timber harvesting operations and extensive oil and gas developments with cutlines, pipelines and wellsites evident on the land surface.

The habitat in this DMA is probably changing more rapidly than anywhere else in the province. Expansion of improved pastureland in small blocks and the smaller cut blocks associated with smaller timber harvesting operations, are opening up the dense forest canopy of coniferous stands and older mixedwood stands in some WMUs. This increases the potential forage and provides openings that mule deer need as a part of their home range, but there is reduced security associated with the improved access in an area where hunting pressure is high, and illegal and native harvests are suspected to be high. Extensive clearing of large blocks and the conversion of unimproved pasture to improved pasture and cropland in the area boardering DMA 4 is significantly reducing both the cover and security aspects of habitat resulting in decreasing mule deer populations. White-tailed deer may be replacing mule deer in many areas as has happened in DMA 4. Accurate data describing habitat losses and gains are not available, but the net amount of "usable" habitat is declining. As in DMA 4 the best habitat is along the rivers and streams where habitat is suitable and security is high.

2.4.2.6 Deer Management Area 6

Deer Management Area 6, an area of boreal foothills and boreal uplands habitats (Figures 2 and 3), is dominated by coniferous and mixedwood forests. Only 11 percent of the land base is privately owned (Table 7). Limited agricultural use, mainly livestock grazing, is made of the private land and a few grazing leases. The dominant land uses are recreation, timber harvesting, and oil and gas development. The continuous forest canopy over much of this area makes it a mediocre habitat for mule deer. The better habitat is associated with the main valleys and tributaries of the North Saskatchewan, Brazeau, Athabasca, Smoky and Little Smoky river systems.

Habitat losses resulting from the small amount of agricultural expansion and large clear cuts are probably being offset by increased forage from smaller cut blocks and oil and gas development. However, high hunting pressure and other outdoor recreational uses in these areas may limit deer use of suitable habitat. New cutting designs and access control or buffering may ease the habitat use problem in the future. Predation is also likely a factor in the suppression of mule deer numbers in parts of this DMA. Wolves, which select mule deer as one of their preferred prey species according to Carbyn (1974), have been well documented throughout much of DMA 6 (E. Bruns, Regional Biologist and K. Smith, Edson Area Biologist, Alberta Fish and Wildlife, pers. comm.).

2.4.2.7 Deer Management Area 7

Deer Management Area 7, an area of alpine, subalpine, boreal uplands, and some montane habitats (Figures 2 and 3), is similar to DMA 6 with extensive areas of coniferous and mixedwood forests that have limited suitability for mule deer. Suitable habitat occurs in the bottoms and lower slopes of the numerous creek and river valleys, which often have a parkland-like aspen habitat. The montane areas have particularly good habitat. Major land uses include timber harvesting, mining and recreation. Land ownership (Table 7) is 10 percent private and 90 percent public.

Habitat in this DMA is changing. Many decades of fire suppression have likely decreased deer habitat as earlier seral stages (grassland and deciduous shrub and tree cover) have been replaced by continuous

stands of conifers. However, timber harvesting has been very active in the last 20 years and has opened up this forest. Larger cut blocks are of limited use for deer as they confine their activities within 100 m or so of the edge, but smaller cut blocks increase food production near essential cover left in the uncut areas. Although hunting pressure on mule deer is low relative to the rest of the province, it is very high in the suitable habitat where access is developed. As in DMA 6 this heavy hunting and other recreational uses may keep deer out of suitable habitat for much of the year. New cutting designs and access control or buffering may ease this problem in the future. DMA 7 also has high levels of annual snowfall resulting in high winter mortality during some years. Mule deer were an important summer and winter food item for wolves in the Nordegg area (Schmidt and Gunson 1985) so wolf predation is likely a significant mortality factor in this DMA as it is in DMA 6.

2.4.2.8 Deer Management Area 8

Deer Management Area 8, an area of boreal mixedwood and boreal foothills (Figures 2 and 3), is a mosaic of mixedwood forests and agricultural development. Agriculture and timber harvesting are the dominant land uses. Suitable mule deer habitat occurs mainly along the major rivers, the Peace and Smoky, and their associated tributaries. Land ownership (Table 7) is 47 percent private and 53 percent public. Much of the public land has been assigned to livestock grazing (including seven Provincial Grazing Reserves), timber harvesting and some oil and gas development. Severe winters are an important limiting factor in this DMA.

Habitat is changing under the influence of agricultural expansion and timber harvesting, but there does not appear to be much change in the important riparian deer habitat. Hunting pressure is quite high but with only moderate access and good cover the deer seem to withstand the pressure in most of this DMA. Even though high quality food in close association with cover is found in many of the riparian areas in this DMA, productivity (defined as the survival and recruitment that determines harvestable surplus) is limited by deep snow for long periods in combination with persistent cold temperatures.

2.4.2.9 Deer Management Area 9

Deer Management Area 9, an area of boreal mixedwood, boreal northlands (Canadian shield) and boreal subarctic habitats (Figures 2 and 3), is characterized by large expanses of mixedwood and coniferous stands and a very severe winter climate. Suitable mule deer habitat is associated mainly with the Peace and Athabasca river systems. Densities and numbers of mule deer decrease as the latitude increases. Deer have been recorded in every WMU in this DMA, but the total contribution to the provincial herd is small. Land uses include a small area of agriculture in the Fort Vermilion/High Level/Carcajou corridor along the Peace River, oil extraction in the Fort McMurray area and timber harvesting. Land ownership is 94 percent public (Table 7).

Habitat in this DMA is quite stable at present. Access and resulting hunting pressure are very low and limited mainly to the vicinity of the settled areas of the Peace River country and Fort McMurray. Habitat changes, associated with the major land uses of forestry, oil and gas development, and mining, have been minor.

2.4.3 Summary of the Current Status of Mule Deer Populations and Habitat

Table 8 summarizes the status of wintering mule deer populations in each DMA in Alberta in early 1986. The area of each DMA is also provided to show the contribution of each DMA to the provincial herd in relation to its land area. Population declines are a problem in DMAs 4 and 5. The problem in DMA 4 is a combination of habitat loss, poor security from disturbance and suspected illegal kill. The problem in DMA 5 is local habitat loss to some degree; however, decreasing security, suspected illegal kill and replacement by white-tailed deer are likely more important. Although significant changes are taking place in the habitat of DMAs 4, 5, 6, 7 and 8, habitat decline appears to be a significant problem only in DMA 4 and some WMUs in DMA 5.

It should be noted that systematic population and habitat inventories, and long-term trend information are available only for parts of DMAs 1, 2 and 4 and some WMUs in 5. Information for most of DMAs 3, 5, 6, 7, 8 and 9 is based on very limited inventories and relies on the subjective assessments of regional Fish and Wildlife Division staff.

Table 8. Summary of the current status of mule deer populations and habitat in Alberta in 1986.

Deer Management Area	Area[a]		Winter Deer Population			Habitat Trend
	km^2	% of Province	Number	% Provincial	Trend[b]	
1	81 975	14	20 950	33	stable	stable
2	12 080	2	11 850	19	stable	stable
3	7 203	1	6 800	11	stable	stable
4	70 235	12	5 700	9	decreasing	decreasing
5	49 316	9	3 700	6	decreasing	decreasing
6	58 488	10	5 050	8	stable	changing
7	28 401	5	2 150	3	stable	changing
8	24 045	4	4 000	6	stable	changing
9	254 913	43	3 350	5	stable	stable
Total	586 656	100	63 550	100		

[a]Does not include National Parks.

[b]Trend refers to the average. The population may fluctuate widely from year to year because of events like severe drought, winter weather or greater than average hunter harvests.

2.4.4 Current Uses of Mule Deer in Alberta

Current uses of mule deer in Alberta include subsistence hunting, recreational hunting, aesthetic enjoyment, scientific research, education and commercial opportunities.

2.4.4.1 Subsistence and Recreational Hunting

Subsistence hunting recognizes the need or "right" to obtain meat, while recreational hunting focuses on the hunting experience with harvesting an animal as an added benefit. Subsistence hunters include those who obtain a Subsistence Licence (185 issued in 1985) and Treaty Indians. A licence or proof of Treaty Indian status is required to hunt mule deer for subsistence purposes, in Alberta.

Among recreational hunters there are those who are satisfied to harvest any age or sex of animal, while others prefer and will harvest only larger "trophy" male animals. The following areas provide different opportunities for licenced hunters interested in antlered mule deer:

1. Limited Entry Areas - Big Game Zones (BGZs) 5, 8 (Figure 6) and Camp Wainwright have low hunter densities and a reasonable opportunity to harvest a 4-point trophy buck. Harvest rates, high in the prairies (BGZ 8) and lower in Kananaskis Country (BGZ 5) and Camp Wainwright, relate to hunter access and the amount of escape cover. These areas provide a quality hunt for those drawn but exclude the general licence holder.

2. Areas With Antler Size Guidelines - The 3-point area in BGZs 7, 9, 10, 11, 12, 13 and 14 (Figure 6), provides opportunity for general licence holders to hunt antlered deer with three or more points, but hunter densities are often high, success rates are low and the chance of obtaining a large 4-point buck is remote.

3. Areas With No Restrictions - Big Game Zones 1, 2, 3, 4, 6 and 16 (Figure 6) provide unrestricted opportunity for general licence holders to hunt. The harvest is small because hunters

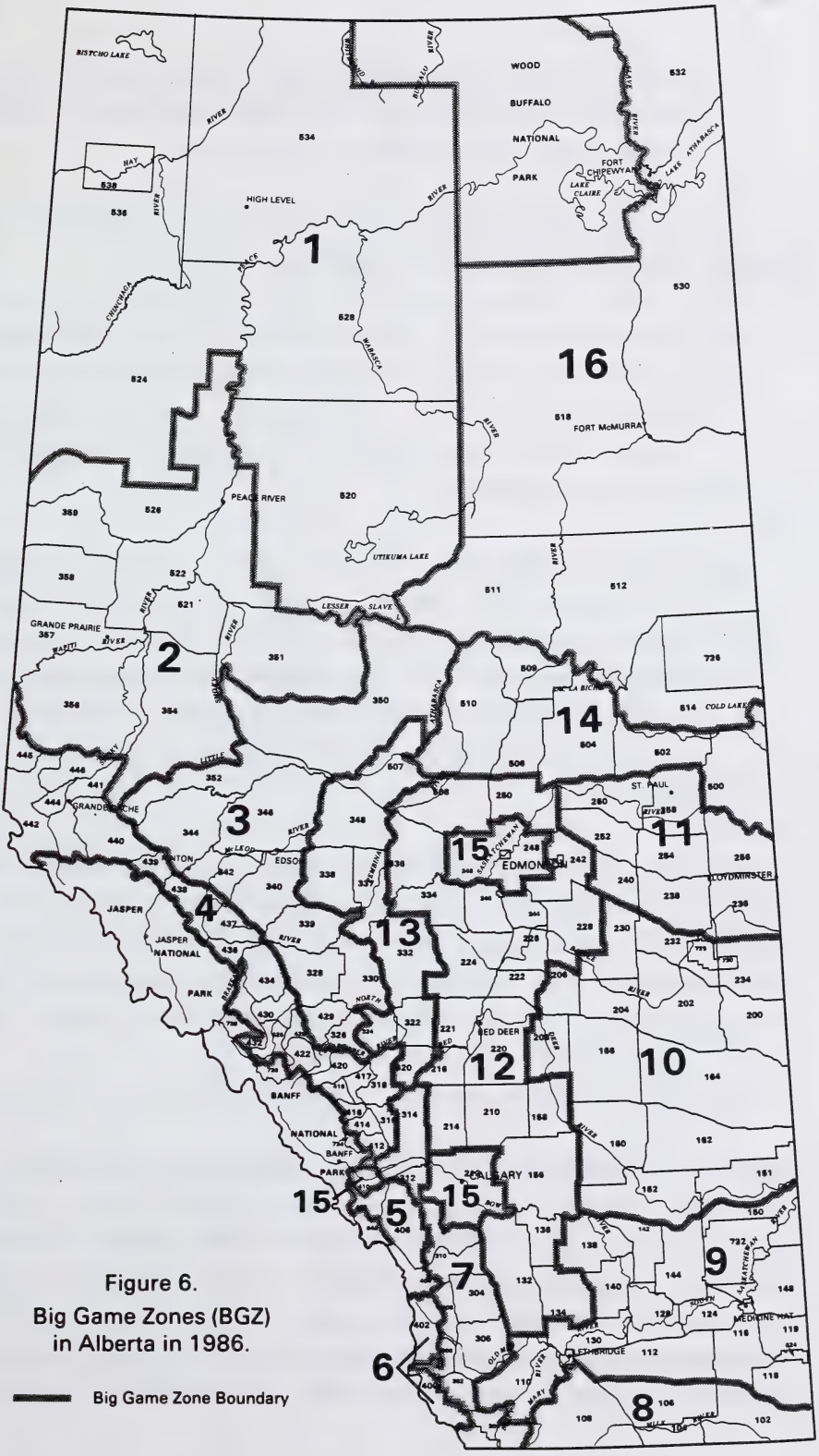

Figure 6.
Big Game Zones (BGZ)
in Alberta in 1986.

Big Game Zone Boundary

are concentrating on their primary target species other than mule deer (e.g., moose or elk), and escape cover is abundant. Larger bucks are available in these zones.

The following areas provide different opportunities for licenced hunters interested in antlerless mule deer:

1. Authorization Areas - Big Game Zones 5, 6 and 7 (Figure 6) have limited-entry permits, which provide additional opportunities by authorizing the general licence holder to use the general licence mule deer tag on either an antlered or antlerless animal in a specified WMU.

2. Special Licence Areas - Big Game Zones 8, 9 and 10 (Figure 6) have limited-entry special licences. The special licence is good for antlerless mule deer in a specified WMU and usually has one tag issued with it. The special licence tag, good only in one WMU, may be held along with the general licence tag good for one antlered mule deer, so more than one mule deer may be harvested.

Big Game Zone 15 (Figure 6) and archery-only time periods throughout Alberta provide an opportunity for bowhunters to take either an antlered or antlerless mule deer. A bow may also be used during the rest of the mule deer hunting season outside Big Game Zone 15, but archers are subject to the same rules as other hunters (e.g., they must be drawn in a limited-entry hunting area).

The various hunting seasons in 1985 are summarized in Table 9.

Numbers of Resident Mule Deer Hunters - Mule deer, white-tailed deer, moose and elk licences represented 90 percent of all the big game hunting licences sold in Alberta in 1984. There were 113 370 hunters involved in purchasing general licences to hunt one or more of these four members of the deer family in 1984. Table 10 shows the number of these hunters that purchased mule deer licences solely and those that purchased licences in combinations with other members of the deer

Table 9. Mule deer hunting seasons in Alberta in 1985.

Big Game Zone	Hunting Season Dates	
	Antlered Mule Deer	Antlerless Mule Deer
1	S11-N30	Closed
2	S18-N30	Closed
3	S18-N30	Closed
4	S25-N30	Closed
5	S25-N30[a]	S25-N30[a]
6	S25-N30	S25-N30[a]
7	N6-N30[b]	N6-N30[a]
8	N6-N30[a,b]	N6-N30[c]
9	N6-N30[b]	N6-N30[c]
10	N6-N30[b]	N6-N30[c]
11	N6-N30[b]	Closed
12	N6-N30[b]	N6-N30[a]
13	N6-N30[b]	Closed
14	N6-N30[b]	Closed
15	S3-N30[d]	Closed
16	S11-N30	Closed

[a]This season was provided only for those who held the applicable authorization and general licence.

[b]This season applied only to 3-point mule deer.

[c]This season applied only to those who held the applicable special licence.

[d]This season applied only to those who held the applicable general licence and a bow hunting licence.

Table 10. Licence combinations held by hunters who purchased at least one of the mule deer, white-tailed deer, moose and elk general licences in 1984.

Licence Combination	General Licences Purchased	
	Number of Hunters	Percent of Hunters
Mule Deer Only	4 980	4
Mule Deer and White-tailed Deer	19 097	17
Mule Deer and Moose	3 940	3
Mule Deer and Elk	3 260	3
Mule Deer, White-tailed Deer and Moose	10 231	9
Mule Deer, White-tailed Deer and Elk	8 479	8
Mule Deer, Moose and Elk	5 956	5
All Others[a]	57 427	51
Totals	113 370	100

[a]All others includes any combination of white-tailed deer, moose and elk that does not include mule deer.

family. This table shows that about half of the hunters that held a mule deer licence, usually purchased another deer family licence; the most popular combination was with a white-tailed deer licence.

The numbers of different types of mule deer hunting licences issued in Alberta in 1984 and 1985 are summarized in Table 11. The general licence has one tag issued with it and provides the authority for the hunter to harvest an antlered mule deer where there is a general open season.

Authorizations provide the authority to use the general licence for either an antlered or antlerless mule deer (as specified on the authorization) in a specific WMU. The authorization expands the opportunity to hunt under the general licence, but the hunter still has only one tag.

Antlered and antlerless mule deer special licences provide the authority to harvest a deer in a specific WMU. One or more (e.g., two in 1985) tags are issued with the special licence and the special licence may be obtained in addition to the general licence or purchased on its own. The Camp Wainwright Deer Licence is a type of special licence.

Quota licences are designed to meet additional harvest goals that are not attainable during the regular season. They were used in 1984 after the authorization and special licences were undersubscribed and were issued on a "first come-first served" basis with one tag.

The number of hunters interested in mule deer hunting (i.e., number of licences sold in any one year) is dependent on a number of factors, such as the following: the combination of licences a person is permitted to purchase; the perceived size of the deer population; whether or not the antlerless hunting season is open; the length of season; whether the licence is a general licence or subject to a draw; how successful hunters have been in past years; and even what the weather is like during the open season. During 1984 and 1985 the choice of licences was relatively liberal (three of moose, elk, mule deer, white-tailed deer), the deer population has been very high, numbers of female authorizations and special licences available were high, harvest success rates have been good and the weather (except for the latter part of the

Table 11. Summary of mule deer hunting licences issued in Alberta in 1984 and 1985.

Licence Type	Number of Licences Issued	
	1984	1985
General	56 161[a]	53 047[a]
Antlered Authorization	1 362[b]	1 353[b]
Antlerless Authorization	1 195[b]	6 540[b]
Antlerless Special Licence	0	9 041[c]
Antlerless Quota Licence	2 389[a]	0
Camp Wainwright	770[c]	770[c]
Total Number of Tags Issued	60 090	72 669

[a]These licences were issued with one tag.

[b]These authorizations expanded the opportunity under the general licence but the hunter still had only one tag.

[c]These special licences were issued with two tags.

1985 season when it was very cold) has been good for hunting. As a result, resident licence sales have been high.

Residence Location, Hunting Effort and Harvest Success of Resident Mule Deer Hunters - Table 12 shows the distribution of resident mule deer licence sales by residence code (see Figure 7 for residence code). This table indicates that mule deer licence sales differ from the distribution of the Alberta human population. A higher percentage of residents from smaller centres and rural areas hunt when compared to those from major urban centres. The proportion of the Calgary population that hunts mule deer is much higher than Edmonton.

The distribution of hunter effort (recreation days) and hunter success (percent of hunters harvesting an animal) is given in Table 13. Hunter effort, reflected in the number of hunter recreation days, was very high in DMAs 1, 2, 4 and 6 and relatively high in DMAs 3, 5 and 8. Distribution of effort is affected by a combination of the abundance and availability of mule deer and the proximity to major urban populations. The number of hunter recreation days for mule deer in DMAs 3, 5, 6, 7, 8 and 9 is inflated. Even though all time in the field is recorded as mule deer hunting effort, much of the effort is actually spent looking for the primary target species, moose and/or elk.

Eighty-two percent of those buying a mule deer general licence actually went hunting in 1985 and spent an average of five days in the field hunting bucks. The 52 991 general and special licence holders harvested 9237 bucks for a harvest success rate of 17 percent. The buck harvest success rate varied from a high of 54 percent in DMA 1 (BGZ 8) to a low of 6 percent in DMA 9 (Table 13).

Hunters seeking antlerless mule deer, including 6540 hunters under authorizations and 9041 hunters under special licence, averaged only 3.7 days and 2.7 days, respectively, in the field in 1985. They harvested 2839 deer under authorizations and 5760 under special licence for harvest success rates of 43 and 64 percent, respectively. The actual success rate for those hunting would be higher because only 79 percent of the authorization holders and 63 percent of the special licence holders actually hunted.

Table 12. General mule deer licence sales by residence code in relation to the Alberta population in each residency code area in 1984.

Residency Code	Number of Alberta Residents	Percent of Alberta Population	Number of General Mule Deer Licences Sold	Percent of People in Code Area Who Buy a Licence	Percent of Licences Sold by Code Area
1	564 242	25	8 098	1	14
2	47 881	2	1 767	4	3
3	592 743	26	11 065	2	20
4	54 954	3	1 731	3	3
5	164 256	7	7 819	5	14
6	316 531	14	13 835	4	25
7	203 719	9	3 367	2	6
8	185 462	8	4 943	3	9
9	79 792	4	2 903	4	5
10	53 033	2	633	1	1
Total	2 262 613	100	56 161	2	100

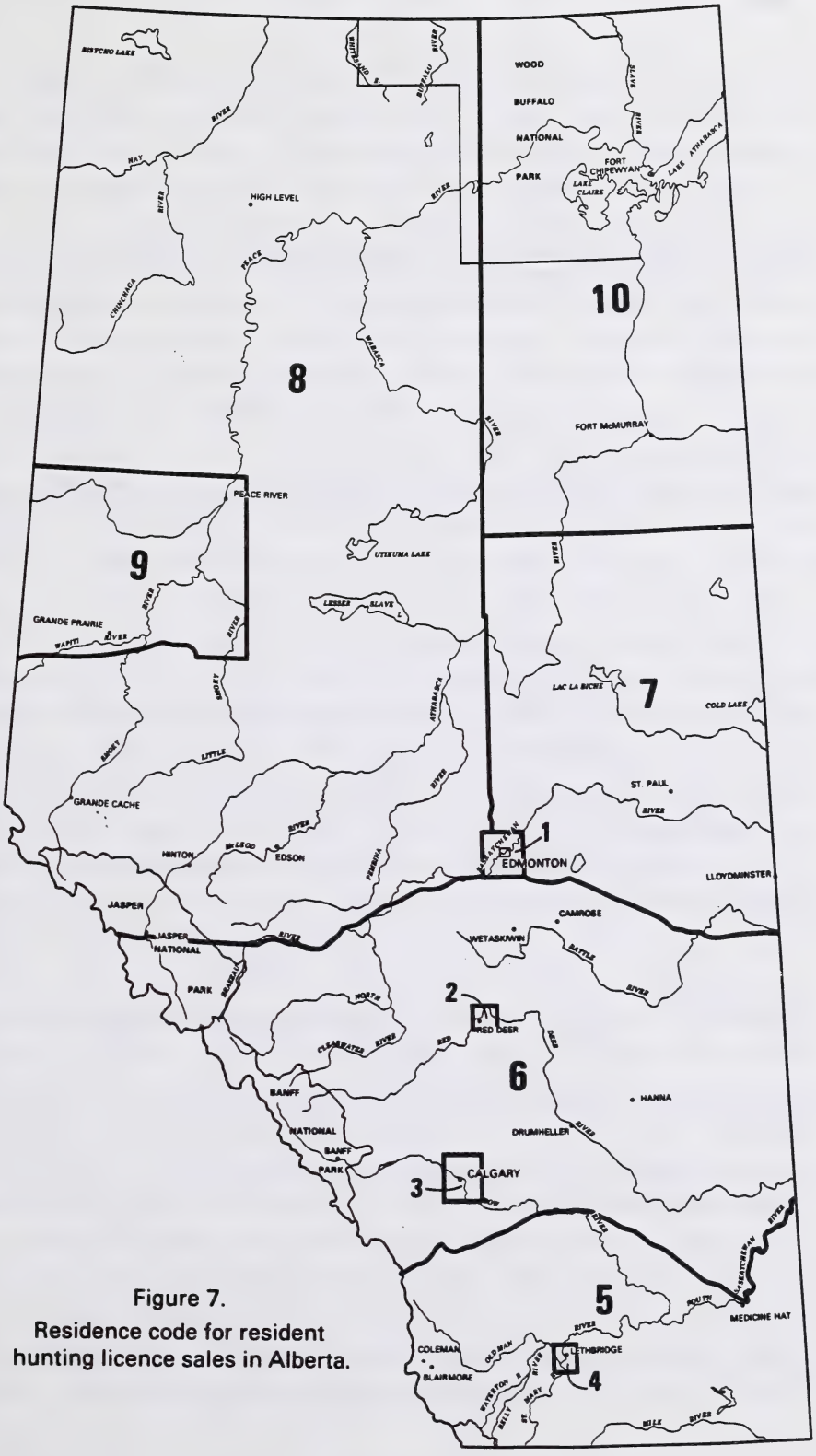

Figure 7.
Residence code for resident hunting licence sales in Alberta.

Table 13. Mule deer hunter recreation days and harvest by Deer Management Area in 1985.

Deer Management Area	Number of Hunter Recreation Days Provided	Number of Animals Harvested		Hunter Harvest Success Rate (%)	
		Antlered[a]	Antlerless[b]	Antlered	Antlerless
1	42 219	3 052	5 207	25	60
2	48 446	2 068	1 629	23	47
3	25 484	571	189	15	27
4	44 052	1 155	1 261	17	49
5	23 167	404	41	9	Closed
6	55 660	1 130	Closed	14	Closed
7	9 273	291	Closed	21	Closed
8	14 945	518	Closed	15	Closed
9	2 432	48	Closed	6	Closed
Total	265 678	9 237	8 327	17	55

[a]Antlered means a mule deer bearing an antler exceeding 10 cm (4 in.) in length.

[b]Antlerless means a mule deer which is not "antlered" and normally includes females and fawns.

Hunters at Camp Wainwright, which has a low population of mule deer, had only a 5 percent success rate for mule deer. However, the tags were also used for white-tailed deer so the mule deer rate would likely be higher for those who concentrated on mule deer hunting.

Treaty Indians in Alberta can hunt without a licence under their treaty rights. Their population totals 46 000 currently, but there is no information on how many of these people hunt and what their effort, success rate and harvest would be for mule deer. Moose and elk are preferred targets because of their larger size, but deer are also taken when they are available.

Numbers, Hunting Effort and Harvest Success of Non-resident Mule Deer Hunters - There were 217 non-resident Canadian mule deer licences sold in 1985 as well 269 non-resident alien mule deer licences. Non-resident licences represented about 1 percent of all mule deer licences sold. Non-residents were required to be accompanied by a licenced guide in Big Game Zones 1, 2, 3, 4, 5, 6 and 16 and WMU 410, and were required to be accompanied by either a licenced guide or an Alberta resident in the remainder of the province. Non-residents were eligible to hunt only male mule deer under a general licence unless they held a bow hunting licence which entitled them to a male or female in Big Game Zone 15. The 486 non-residents harvested an estimated 113 male mule deer, a harvest success rate of 22 percent. They spent an estimated 2713 hunter days or 5.7 days per hunter in the field.

Crippling Losses and Illegal Harvest - Crippling losses as a result of hunting are not documented in Alberta, but Losch and Samuel (1976) reviewed several studies in the United States and found an average loss equal to 23 percent of the reported kill during either-sex seasons (15 studies) and 27 percent during buck only seasons (11 studies). If Alberta were similar the annual loss would be about 4000 mule deer.

Illegal harvests include animals mistakenly shot and left (e.g., mule deer doe in an area where only white-tailed deer does are open, a 2-point mule deer buck in a 3-point area) and those intentionally taken without a licence or by illegal means (e.g., using lights at night). Numbers are very difficult to determine but illegal harvest of

mule deer is suspected to be in the thousands (District Officers, Alberta Fish and Wildlife, pers. comm.) and may be a major limiting factor in parts of Alberta.

2.4.4.2 Aesthetic Enjoyment

Phillips et al. (1977) found that 1 390 980 Albertans (79 percent of the provincial population) were involved in nonconsumptive wildlife recreational activities such as observation, photography and study during 1975-76, providing 16 678 600 days of recreation. Assuming the same level of involvement in 1985, the figures would be 1 855 710 people and 22 250 890 recreation days. The study did not provide a breakdown of nonconsumptive recreational activities, but animal life enjoyment accounted for 40 percent of the activity and deer were the most preferred species in the "liked to see" category. Mule deer thus form an integral part of Albertans' aesthetic enjoyment of wildlife.

A more recent study by Filion et al. (1983) divided nonconsumptive wildlife use into activities around a person's residence (such as feeding, watching, photographing, studying, and maintaining food and shelter), trips specifically oriented towards wildlife-related activities, and enjoyment of wildlife during trips or outings for other purposes. In 1981, 12.3 million Canadians (67 percent of the population) participated in wildlife-related activities around their residences, 3.6 million people (19 percent) made trips to enjoy wildlife, and 8.1 million people (44 percent) enjoyed wildlife during other outings. In total 15.5 million Canadians (84 percent) were involved in wildlife-related activities in 1981. This study was not species specific either but 9 percent of the wildlife-related trips were oriented toward large mammals. Mule deer would figure prominently in the large mammal category in those parts of Canada where they occur (e.g., Alberta). Watching was the most popular activity (77 percent of Canadians) with feeding, studying and photographing also popular. Assuming Alberta percentages are similar to national figures, wildlife-related activities would have involved 1.9 million people in 1981.

2.4.4.3 Scientific Research and Educational Uses

Mule deer research is conducted by universities, the Fish and

Wildlife Division, the Canadian Wildlife Service and private consultants. Past studies have focused on behavior, habitat use, productivity, parasites and disease, and the effects of different harvest strategies on populations. Some of these studies are ongoing.

Deer are used extensively in educational materials dealing with ecological principles such as population regulation and habitat requirements (e.g., one of the "Project Wild" lessons used in the schools).

2.4.4.4 Commercial Uses

There are direct commercial opportunities resulting from both the consumptive and nonconsumptive use of mule deer. Consumptive opportunities result from the requirement that non-residents must be accompanied by a guide to hunt in Big Game Zones 1, 2, 3, 4, 5, 6 and 16 in Alberta. Since non-residents could be accompanied by either a guide or a resident in the other Big Game Zones, it is not known how many guides were involved with the 486 licenced non-resident mule deer hunters in 1985. Some residents also may use guides.

The only known direct benefits from the nonconsumptive use of mule deer occur on big game farms. Current regulations restrict uses on licenced big game farms to photography, sale of live animals to other game farm operators, and public display. There were 18 licenced big game farms in Alberta as of April 15, 1986 but only two had mule deer, for an overall total of three captive deer. Publicly owned zoos and wildlife parks also display mule deer. Another business that uses mule deer and other wildlife as major attractions is trail riding, which is concentrated in the Eastern Slopes of Alberta. There are currently 60 certified operators in the Eastern Slopes.

2.4.5 The Value of Mule Deer to Albertans

The previous section on current uses of mule deer in Alberta demonstrated the high demand and the obvious non-economic benefit of hundreds of thousands of recreation days accrued from both the consumptive and nonconsumptive use of the deer. Another way of assessing the benefit of mule deer is to look at their dollar value to individuals and the Alberta economy. This section will outline both the positive

benefits resulting from the mule deer population and the costs associated with the damage they can do.

2.4.5.1 Mule Deer Hunting

The value of hunting to Albertans has been studied by Philips et al. (1977) in 1975-76 and Filion et al. (1983) in 1981. Philips et al. (1977) determined the average expenditure by hunters for licences, capital equipment (guns, vehicles, special equipment) and variable costs (travel, lodging, food, rentals, guides, meat cutting, ammunition). They also determined an extramarket benefit which was the amount hunters said they would pay to hunt over and above these costs. Filion et al. (1983) worked only on the expenditure aspect. Neither study separated mule deer from other big game. The calculations in this management plan assume that mule deer represent about 25 percent of the big game value based on licence sales and recreation days in 1985.

The value of mule deer hunting by residents is summarized in Table 14. Licence fees, capital costs and variable costs are all costs to the hunter, but represent benefits to those providing the goods and services. Philips et al. (1977) estimated this figure to be $352.89 per hunter per year in 1975, while Filion et al. (1983) had a figure of $1099 for all hunting-related costs per hunter per year in 1981. The two figures are similar when inflation is taken into account and adjustments are made to reduce Filion's figures to big game hunting only. The 1985 figure for mule deer was obtained by multiplying the 1975 figures by the increase in the consumer price index (2.13 times greater) and dividing this figure by four to get the mule deer share of big game, except licence costs where actual values in 1985 were available.

Mule deer values or expenditures were an estimated $197 per hunter per year in 1985 for a total of $9.7 million for all resident mule deer hunters. Meat provided an additional value of $2.9 million. The 1985 extramarket value for mule deer was estimated to be $5.3 million. This brings the total value of mule deer hunting in 1985 to $17.8 million, which provided a significant boost to local economies over much of Alberta.

Non-resident contributions to the economy are probably less than

Table 14. Value of mule deer hunting by residents in 1985.

Value Category	Philips et al. (1977) Value Estimate per Active Resident Big Game Hunter 1975/76 ($)	Value for Mule Deer 1985[a]	
		Per Active Hunter ($)	Provincial Total ($)
Licence	9.56	13	641 000
Capital	189.97	102	5 030 000
Variable	153.36	82	4 043 000
Meat[b]	NA	58	2 854 000
Extramarket	200.85	107	5 276 000
Total	553.74	362	17 844 000

[a]Based on the assumption that 49 310 of the 62 032 mule deer licences represented active mule deer hunters in 1985.

[b]Meat value is calculated using an average carcass weight of 45 kg (100 lb.) and a meat value of $3.53/kg ($1.60/lb.). There were 17 836 mule deer harvested in 1985 by 49 310 active hunters. Phillips et al. did not indicate a value for meat in 1975/76.

$100 000 (licence fees in 1985 accounted for $56 950) as mule deer are not the primary goal of most non-resident big game hunters.

2.4.5.2 Nonconsumptive Use of Mule Deer

It is very difficult to obtain dollar values for nonconsumptive use of wildlife because this activity is often associated with many other things we do. Furthermore, nonconsumptive use is not usually species specific so it would be difficult to assign a value to a particular animal. Both Philips et al. (1977) and Filion et al. (1983) calculated values for nonconsumptive use. Philips et al. (1977) provided only an extramarket value of $3 per participant per day for all wildlife or a total of $50 035 800 which, adjusted to 1985, would be $107 million. Deer were first in a list of animals people most like to see. Filion's study determined expenditures for trips where the primary intent was nonconsumptive wildlife use. Twenty percent of Albertans participated in these types of trips and spent $863 per year for equipment, supplies and services. Adjusted to 1985 this would be $1069 per participant per year or a total of $500 million. Forty-four percent of the encounters involved large mammals (Filion et al. 1983). If mule deer are assumed to make up about 15 percent of the large mammal encounters, then expenditures attributed to them would be $33 million. Values for other nonconsumptive activities were not calculated for Alberta, but would be about $14 million for mule deer if similar to the national percentages where primary nonconsumptive trips accounted for 50 percent of expenditures, hunting was 28 percent and other activities 22 percent.

Although the accuracy of these figures is only approximate, it is obvious that nonconsumptive use of mule deer, both alone and in conjunction with other wildlife, provides an important stimulus in the Alberta economy. The total value of hunting and nonconsumptive use of mule deer appears to be in the $65 million range annually.

2.4.5.3 Mule Deer Damage in Alberta

Deer cause damage (in approximate descending order of importance) to stacked hay or greenfeed during winter, hay fields, swaths left over winter, shrubs and trees (ornamental, fruit-producing and shelterbelts), winter crops, pasture, cereal grains in summer and fall, gardens, seed

crops, stored grain, single hay bales and fences. Deer are also involved in vehicle collisions.

The average number of deer (both species) damage complaints during 1982 to 1984 was 253 per year (District Occurrence Reports, Alberta Fish and Wildlife Division). Tables 15 and 16 show the type of damage caused by mule deer in comparison to other ungulate species. Owners of damaged field crops and swathed crops are eligible to receive compensation payments under the Wildlife Support Program. Damage to stored, baled and stacked crops and gardens, trees and shrubs is not considered eligible for compensation. The limited compensation coverage, the difficulty in measuring losses to hay fields and pasture, and unreported damages make estimates for crop losses incomplete.

Under the Wildlife Damage Fund the average loss per claim for deer damage in 1980-83 was $1753. Actual dollar losses for 1980 to 1983 are shown in Table 17. Wig (1980) estimated loss to feed stacks at $778 per complaint for deer. This would result in overall losses of $58 350 for the average 75 complaints per year in 1980-83. Damage in some years can be severe (e.g., there were 802 deer damage complaints in 1984/85) and may exceed $1 million for deer alone. Although not all deer complaints identify the species, known data suggest 55-60 percent of the crop damage complaints are attributable to mule deer.

Statistics from Alberta insurance companies indicate that there were 2992 automobile accidents in 1980 that involved collisions with wild or domestic animals, resulting in $3 million in vehicle damage, and 147 human injuries but no fatalities (Sanderson 1983). Seventy-eight percent involved wild animals, but there is no breakdown by species. Deer would likely be involved in a high percentage of the wild animal collisions.

Thus the damage caused by mule deer would likely average less than $1 million annually, which is very small compared to the annual value or benefit of $65 million.

2.4.6 Current Management Programs for Mule Deer in Alberta

The Fish and Wildlife Policy (Alberta Fish and Wildlife 1982) established a general goal of maintaining the current population and habitat for mule deer. The current management program is designed to

Table 15. Occurrence of ungulate damage by crop category in Alberta in 1982-84[a].

Ungulate	Number	%			
		Standing	Swathed	Haystacks	Other
Antelope	31	62	6	6	26
Mule Deer	121	30	2	60	8
White-tailed Deer	99	17	17	31	35
Unclass Deer	210	18	14	45	23
Elk	250	14	9	64	13
Moose	23	17	9	48	26
Total	734	20	10	51	19

[a]Data source = Animal Incident Documentation System to December 17, 1984.

Table 16. Occurrence of ungulate damage by crop class in Alberta in 1982-84[a].

Ungulate	Number	%		
		Crop	Garden	Tree
Antelope	31	100	0	0
Mule Deer	214	56	34	10
White-tailed Deer	131	76	18	6
Unclass Deer	339	62	31	7
Elk	253	99	1	-
Moose	34	67	9	24
Total	1002	73	21	6

[a]Data source = Animal Incident Documentation System to December 17, 1984.

Table 17. Actual dollar losses of crops[a] damaged by ungulates in Alberta[b].

Ungulate	Actual Dollar Loss				
	1980	1981	1982	1983	Total
Antelope	1 670	1 480	5 852	2 233	11 235
Deer	60 849	17 757	50 516	11 145	140 267
Elk	45 722	12 130	27 485	12 497	97 834
Moose			925		925
Mixed Ungulates	47 994	21 351	90 718	15 723	175 786
Total	156 235	52 718	175 496	41 598	426 047

[a]Includes only those "crops" covered by Wildlife Damage Fund payments.

[b]Data source = Alberta Hail and Crop Insurance Records.

meet this goal, to maintain hunting opportunity, to enhance hunter-landowner relations and to minimize damage caused by mule deer.

2.4.6.1 Mule Deer Population Inventory

It is necessary to conduct periodic inventories of mule deer populations to obtain information on deer numbers, distribution, densities, use of different habitats, age/sex ratios and productivity. This is particularly important with populations that are heavily exploited and live in a climate where significant annual fluctuations in numbers can occur. The geographic unit used for deer inventories (surveys) in Alberta is the wildlife management unit. Surveys may be extensive where they sample all areas of the WMU or they may be intensive where they sample specific proportions of stratified deer habitat in the WMU. Extensive surveys are used mainly for reconnaissance to set up intensive surveys, which become part of the annual monitoring program for deer populations.

There are many techniques available for deer population inventories such as track counts, pellet counts, browse surveys, night-lighting, roadside counts, aerial surveys and extrapolation of hunter harvest data. All methods have good points and drawbacks. The technique that comes closest to meeting our needs in Alberta is the aerial survey.

Aerial surveys produce usable information over large geographic areas with limited manpower and funding, but have some drawbacks. The major limitation is that the technique only works well where deer are highly visible, such as in open prairie or forested habitats dominated by deciduous shrubs and trees. Even in these habitats, it is likely that a percentage of the deer are missed, depending on how dense the deciduous cover is. Aerial surveys can only be used effectively in DMAs 1, 2, 4, and parts of 5 and 8 because the other DMAs have too much coniferous forest, which makes deer visibility poor and aerial surveys ineffective. The other major drawback is that aerial surveys, with the exception of a few very open prairie habitats, must be conducted during the winter so there is very little information about deer distribution and habitat use at other times of the year.

A survey approach was put together in July 1985, as the Provincial Survey Format for Mule Deer and White-tailed Deer (Appendix I). The

survey format includes both deer species because their ranges overlap significantly in Alberta. Surveys were prioritized and WMUs were placed on a rotation system based on information needs, visibility limitations and cost considerations.

The following is a brief summary of the deer survey format for Alberta. Aerial deer surveys will not be conducted in DMAs 3, 6, 7, 9 and most of 5 and 8 because WMUs in these DMAs have too much coniferous cover or do not make a significant contribution to recreational deer hunting in Alberta.

Twenty-nine of the 30 WMUs in DMA 1 are scheduled for aerial deer surveys. Eight of the 29 will be surveyed every third year while the remaining 21 will be surveyed every second year. Eight of the nine WMUs in DMA 2 are scheduled for aerial deer surveys. Two of the eight will be surveyed every third year while the other six will be covered every second year. Only 20 of the 34 WMUs in DMA 4 are scheduled for aerial deer surveys. Two of the 20 (Camp Wainwright) will be surveyed annually while the rest will be covered every third year. The rotational survey is designed to sample several WMUs in the prairie and parkland cover types each year and cover all the better deer habitat at least once every three years.

Although not part of the "deer" survey format, rotational surveys for moose and elk in DMAs 5 and 8 do provide useful information on deer populations. There are also periodic surveys done for special projects such as the Strathcona Shotgun Deer Hunt.

The aerial surveys are designed as follows: in DMA 1 (prairie) to census permanent blocks of known area and location within good deer habitat; in DMA 2 (foothills) to census permanent known area blocks in some WMUs and random stratified square mile quadrats in other WMUs; and in DMA 4 (parkland) to census random stratified square mile quadrats. These surveys all require that the deer habitat in these WMUs be mapped and evaluated for capability and that areas of the various habitat types be measured. Current surveys are designed at a sampling intensity that will provide population estimates for the WMU at a precision level of plus or minus 30 percent.

2.4.6.2 Mule Deer Habitat Inventory

Mapping and assessment of mule deer habitat is being done at several different scales in the province. A 1:1 000 000 scale Ecological Land Classification (ELC)-type landscape map of Alberta depicting 12 broad climatic regions and 278 physiographic/landform subregions was prepared by Pedocan (1984). One of four arbitrary classes of current habitat suitability (best, moderate, poor, inadequate) was assigned to each subregion. Provincially there were 43 997 km^2 of "best" (7 percent of Alberta), 180 200 of "moderate" (30 percent), 278 160 km^2 of "poor" (46 percent), and 106 123 km^2 of "inadequate" (17 percent). Mean summer densities of mule deer for the four habitat suitability classes were estimated to be one deer/km^2 (best), 0.4 deer/km^2 (moderate), 0.1 deer/km^2 (poor) and 0 deer/km^2 (inadequate), producing a provincial population estimate based solely on habitat of 143 893 mule deer. This scale of habitat mapping is useful only for a provincial overview and cannot be used at the WMU level.

The ELC-type landscape map has been tested at the 1:250 000 scale for two map sheets (Rocky-83B and Wapiti-83L) in Alberta. The 278 habitat subregions were subdivided into "wildlife habitat districts"; there were 258 wildlife habitat districts (WHDs) on the Rocky mapsheet and only 106 on Wapiti where mapping detail was reduced. Current habitat suitability was assessed for mule deer on these map sheets. This scale should be useful for planning at the WMU level but is still inadequate for dealing with deer populations from a stratified survey or habitat protection/development point of view.

For operational use, mapping of units at the quarter-section to one-section size is desirable. This unit size more closely approximates home range sizes for deer and can be used effectively for planning and conducting aerial surveys and directing habitat protection/development efforts. The Central and Northeast Fish and Wildlife Regions have completed deer habitat mapping and assessment at this detailed scale for 50 of the 62 WMUs under their jurisdiction. The techniques used are outlined in Appendix II. The remaining 12 WMUs in the Northeast Region are in boreal habitats that are low priority for deer; however, information gathered during moose habitat assessment may be useful for a preliminary assessment of deer habitat. Deer habitat has thus been

assessed for part of DMA 5, all of DMA 4, part of DMA 2, and part of DMA 1. The best habitat in the rest of DMA 1 and the rest of the DMAs in the province was identified under an older system of "Wildlife Key Area" mapping which should be discussed briefly.

The "Wildlife Key Area Maps" began development in 1972 and have evolved and been updated several times. These maps identified "key" deer range which included the "best" deer habitat, especially important winter ranges. It did not include much of what the current system would identify as "moderate" or "poor" habitat. The key area maps were intended to identify the most important habitat for land use planning and habitat protection purposes. This information was provided to many government agencies and the public and became the basis for the Division's involvement in the Land Use Referral process in government. The major limitation of this system was and is its failure to include lower quality but important deer habitat that, in many areas, supports most of the deer population because there is very little or no "best" habitat present. The new system, presented in the previous paragraph was intended to replace the "Wildlife Key Area Maps" for deer in DMAs 1, 2 and 4 and part of 5 and 8, but Key Area Maps will remain in DMAs 3, 6, 7, 9 and the rest of 5 and 8 until a more suitable system for deer in these areas is found.

The habitat inventory discussed up to this point has dealt mainly with programs that determine how much habitat exists and where it occurs. This reveals very little about the quality of the habitat, i.e., the ability of habitat to provide food and cover for the deer. Isolated studies have examined cover and browse (food) quality in Alberta, but there is no systematic quantitative annual assessment of deer habitat quality. Regional staff periodically conduct limited spot checks of browse quality in response to events such as hard winters, drought or suspected overpopulation. Jaques (1980) examined 259 sites in the aspen parkland of Red Deer County and found that about 60 percent of these sites were only poor to fair for deer due to intensive livestock use. This is one of the reasons deer populations are often lower than expected when only the quantity of deer habitat is assessed rather than quantity and quality.

2.4.6.3 Mule Deer Habitat Protection and Development

Habitat protection approaches are different on public land than private land but the intent for these approaches is to retain existing quantity and quality of habitat on both. On public land, important deer habitat has been identified through habitat assessment and the Division's interest has been declared through the key area maps and the public land reservation system. Through the referral process the Division makes recommendations that retain habitat, reduce the impact of various land uses or mitigate habitat losses resulting from the land uses. The land uses include activities and developments such as seismic lines, well sites, pipelines, power lines, coal mines, water impoundments, cut blocks in timber harvesting, roads, clearing for annual cropland, more intensified grazing, urbanization, industrial plant sites, and high density outdoor recreation developments.

During the last decade the government has evolved a process where large blocks of public land are allocated to different land uses through "Integrated Resource Plans" (IRPs). Mule deer and other wildlife habitat needs are identified and discussed during the planning process with a view to incorporating these needs in the IRP. There are often conflicting needs for the land base (i.e., habitat) so the long term stability of wildlife populations will require enhancement/mitigative strategies to offset losses to other land uses. As of April 1986, eight IRPs had been approved by Cabinet (Jean D'Or Prairie, Castle River, Big Bend, Lakeland, Frost Hills, Kananaskis Country, Nordegg-Red Deer River, Brazeau-Pembina), one was ready for approval (Rocky-North Saskatchewan) and 11 others were in various stages of planning or review (Bear River-Wapiti, Canmore Corridor, Sturgeon Lake-Puskwaskau East, Ghost River, Keg River, Peace River, Coal Branch, Cold Lake, Lac La Biche-McClelland Lake, Poll Haven, Livingstone-Porcupine Hills).

There are also smaller parcels of public land where wildlife values are part of the planning process such as the Range Improvement Program administered by the Public Lands Division and Timber Harvesting Plans worked out with Alberta Forest Service and timber company staff. Wildlife concerns also form part of the input for major projects managed by Alberta Environment such as the Dickson and Three Rivers dams.

The approach for habitat protection on private land occurs through

planning and dealing directly with private landowners. The planning level inputs were made into the regional planning commission plans and at the county, municipal district, improvement district and special area levels in the 1970s and early 1980s. Generally, the plans identified important wildlife areas, including mule deer range, and stressed their importance to the local people, although there were no land use bylaws that specifically protected habitat solely for wildlife.

Dealing directly with the private landowner focuses on four aspects. The first aspect involves the provision of information on the habitat requirements of deer and techniques to attract them. The second aspect involves assistance in the prevention of deer damage. The third aspect is the promotion of better hunter-landowner relations through hunter training, the Use Respect Program and enforcement of trespass laws. The fourth aspect is the provision of direct incentives to retain and/or improve wildlife habitat by providing landowner co-operators with recognition items (signs, hats, pins, crests), cash payments, tax relief, and developments such as fencing, watering sites and stream crossings to improve on-farm management of livestock. This program started as a pilot project in the County of Red Deer in 1978 with the retention of 4452 ha of habitat. It has recently been expanded to other municipal jurisdictions in the Central, Northeast and Southern Regions. It is jointly funded by the Alberta Fish and Wildlife Division and Wildlife Habitat Canada and is administered by the Division. The mule deer is one of the species that will benefit from such a program.

Habitat development projects to enhance mule deer habitat have occurred in all of the DMAs and are summarized in Table 18. These projects have been aimed at increasing the carrying capacity of the range by increasing the food component and in some cases cover as well. Programs like this could benefit up to 225 deer if all of the 5193 ha were the "best" winter mule deer habitat. Habitat development projects are funded by Buck for Wildlife donations and are administered by the Division, but volunteer efforts by groups like the Alberta Fish and Game Association increase the success of the program. Habitat enhancement efforts must expand in the future to keep pace with anticipated losses of habitat and lowering of habitat quality in some areas. However, development projects will only represent a small fraction of the habitat

Table 18. Buck for Wildlife habitat enhancement projects that benefit deer.

Deer Management Area	Enhancement Activity	Number	
		Projects	Hectares
1	Increasing Food and Cover	4	477
2	Clearing to Increase Browse	2	344
3	Clearing to Increase Browse	1	40
4	Increasing Food, Cover and Water	6	1479
5	Timber Harvesting Plans to Increase Browse	1	NA[a]
6	Timber Harvesting Plans to Increase Browse	1	NA
	Clearing to Increase Browse	1	18
7	Clearing/Burning to Increase Forage	4	1604
8	Clearing to Increase Browse	15	648
	Fencing Key Habitat to Enhance Food and Cover	3	421
9	Burns	2	162
Total		40	5193

[a]NA - Not available because the number of hectares involved has not been tabulated to date.

needed to maintain mule deer populations. The bulk of the habitat must be retained and managed through habitat protection and integrated resource planning.

2.4.6.4 Mule Deer Population Management and Recreational Hunting

The current mule deer population goal is to maintain the present herd and examine the feasibility of increasing the herd over parts of the range, especially in DMAs 1, 2, 3, 4 and 5 where interest in hunting is high and generally exceeds the supply and in DMAs 6, 7 and parts of 8, which may be more suitable for habitat enhancement because timber harvesting is one of the major land uses. The mule deer herd is limited by habitat quantity and quality, weather severity, competition with wild and domestic ungulates, predation, parasites and disease, accidents and hunting. Although the effect of these limiting or mortality factors can be manipulated to varying degrees by management, most of the effort in Alberta is currently directed towards hunting because it has replaced much of the mortality previously attributed to the other factors. This section will deal with the management and allocation of hunting opportunity for mule deer in Alberta. A following section deals with the other mortality factors.

Phillips et al. (1977) found that the three major reasons for hunting were for enjoyment (44 percent), to get meat (37 percent), and to get a trophy (17 percent). The current system of allocating recreational hunting of mule deer attempts to provide these opportunities, while minimizing hunter-landowner conflicts and, through the use of hunting harvest as a tool, reducing deer damage.

Some general principles regarding hunting seasons have been applied to mule deer. There are common opening and closing dates over large areas to provide opportunity while dispersing the hunting pressure. Current seasons are the longest (about 80 days) where the deer are least vulnerable because of abundant escape cover and low hunting pressure (DMAs 8 and 9). Seasons become progressively shorter (73 days) as hunting pressure increases (DMAs 3, 6 and 7). In Kananaskis Country (the north half of DMA 3) the open season has been reduced to 66 days to reduce overlap with non-hunting outdoor recreation users. The shortest seasons (24 days) occur where the deer are very vulnerable because

escape cover is limited and hunting pressure is high, and much of deer hunting is concentrated on private land (DMAs 1, 2, 4 and 5). Hunting seasons are generally designed to start after nonconsumptive outdoor recreation uses have decreased in early to mid-September and before the onset of severe winter stress in early to mid-December. Limited entry draws (authorizations and special licences) are used to control the harvest or limit the density of hunters in a WMU or both. The recognition that hunting with a bow requires the use of different hunting techniques that may be difficult to employ during a season when rifles are the most common firearm, has resulted in "archery only" seasons in Alberta. Three areas have been designated "archery only" for the entire hunting season while most other areas of the province have an "archery only" time period before the regular season.

2.4.6.5 Recreational Goals for Mule Deer Hunting

Deer Management Areas 6, 7, 8 and 9 - Precise population estimates at the WMU level are not possible in DMAs 6, 7, 8 and 9 because the habitat has not yet been mapped and assessed for mule deer and there are currently no practical population inventory methods. The goal is to provide recreational opportunity with long seasons but limit the harvest to bucks-only. Escape cover is abundant and bucks seem to withstand long open seasons as substantiated by harvest questionnaire data and continued presence of older, larger bucks in the harvest. Although not documented by detailed study, production of a harvestable surplus is felt to be limited by localized habitat availability, severe winters and predation by wolves in some locations. There is currently no season on antlerless animals (does and fawns) because of the suspected low survival rates and absence of precise population data. An additional reason for restricting antlerless harvests is to ensure mule deer for nonconsumptive users who frequent these DMAs (especially 6 and 7) in large numbers.

Deer Management Area 3 - Some information on habitat and populations has been collected for DMA 3. This management area is more productive than DMAs 6, 7, 8 and 9 because of milder winters on the foothills

winter ranges in adjacent DMA 2 (where many summer residents of DMA 3 overwinter) and fewer predators. Even though productivity is high, the heavy hunting pressure and relatively high vulnerability require restrictive controls on opportunity. Bucks are harvested using two strategies in DMA 3. The southern portion of the DMA has abundant escape cover and can stand a long open season where general licence holders can hunt. In Kananaskis Country, the northern portion of the DMA, the number of buck licences is limited by a draw, which provides a high quality hunting experience by maintaining a low density of hunters. This limited-entry hunt also ensures escapement of some larger bucks and reduces any potential conflicts with other users in this recreation area.

The high productivity of mule deer allows the provision of an antlerless deer season, but overharvest would occur if the number of hunters was not limited. Since population estimates are based on limited data and deer from this DMA migrate to winter ranges in DMA 2, the harvest rate is very conservative to avoid overharvest and also to ensure deer for nonconsumptive users.

Deer Management Areas 1, 2 and 4 - The information on deer populations and habitat in DMAs 1, 2 and 4 is much better, but hunting pressure is very high, escape cover is often limited and 82 percent of the land is privately owned. The goal is to provide recreational opportunity through a sustained yield that maintains deer numbers at levels acceptable to private landowners (these levels may be below the capacity of the habitat in some areas). Neither the buck nor the doe population can withstand an open season so it is necessary to use a system that limits the harvest.

Hunting of bucks is permitted during a short open season, but the hunter can only harvest a 3-point or larger buck. This scheme allows any licenced mule deer hunter to go hunting while ensuring survival of yearling bucks for breeding. Frequent complaints under this system are that there are too many hunters in certain areas, not enough bucks of legal size, not any 4-point bucks and too many bucks smaller than 3-points are being shot and abandoned. The solution for these complaints is a limited-entry hunt that controls both the harvest and

hunter density. The result should be a higher harvest success rate, greater availability of larger bucks and lower hunter densities, all of which contribute to a quality hunt, but overall opportunity is reduced.

To meet the demand for trophy bucks, Big Game Zone 8 (WMUs 102, 104, 106, 108) in DMA 1 has been identified as a trophy area. Here there is a draw for bucks and a 3-point size restriction as well. Although there is public interest in retaining the 3-point regulation in this area, its retention actually focuses all the hunting pressure on the larger bucks and decreases their availability in future years.

DMAs 1, 2 and 4 have a moderate (northern WMUs) to high (southern and foothill WMUs) productivity so there are large numbers of antlerless deer available to harvest in most years under the sustained yield goal. A draw (both authorizations and special licences were used in 1985) is essential to control the harvest and was used throughout DMAs 1 and 2 and most of 4 in 1985. A small portion of DMA 4 (Big Game Zone 11) has a very low density mule deer population, which cannot sustain an antlerless harvest, so that portion is closed at the present time. After severe drought, when crop damage impacts are high and natural deer range is in poor condition, the goal would be to reduce the population. Once the range has recovered, harvest rates would be lowered to allow the population to increase. After one or more severe winters when the population has been naturally reduced, the goal would again be to lower the harvest and allow population recovery.

Deer Management Area 5 - DMA 5 has characteristics of both the boreal forest and the settled agricultural part of Alberta. There is some population and habitat information but it is limited. Hunting pressure is high as is deer vulnerability in the agricultural portion of this DMA. Bucks can be hunted under a general licence, but the harvest must be controlled using a 3-point antler restriction. Seasons are much shorter than in the forested part of Alberta to accommodate agricultural interests. There is no female season because of suspected lower productivity as well as the lack of precise population data.

2.4.6.6 Harvest Goals for Mule Deer Hunting

Harvest goals, in terms of numbers of animals expressed as a

Table 19. Harvest goals for mule deer by Big Game Zone and Deer Management Area when maintaining current populations is the goal.

Deer Management Area	Harvest Goal As a Percentage of the Preseason Population Estimate in Each Wildlife Management Unit	
	Male (antlered)	Female (antlerless)
1 (BGZ 8)	7[a,b]	12[b]
1 (BGZs 9, 10, 12)	10[a]	12[b]
2 (BGZ 7)	10[a]	12[b]
3 (BGZ 5)	NA[b]	NA[b]
3 (BGZ 6)	NA	NA[b]
4 (BGZs 10, 12)	10[a]	12[b]
4 (BGZ 11)	10[a]	Closed
5 (BGZs 13, 14)	10[a]	Closed
6 (BGZs 2, 3)	NA	Closed
7 (BGZ 4)	NA	Closed
8 (BGZ 2)	NA	Closed
9 (BGZs 1, 2, 16)	NA	Closed

BGZ = Big Game Zone NA = Not Applicable

[a]Harvest is limited to bucks having antlers with at least 3-points on one side, excluding the brow tine.

[b]The number of hunters in WMUs in these DMAs is controlled by a draw (both authorizations and special licences were used in 1985).

percentage of the preseason population estimate, are outlined in Table 19. These strategies represent the average situation when maintaining current populations is the goal. Harvest rates would have to be increased if population reductions were the goal and decreased if population increases were desired. Table 19 summarizes the following four strategies used to harvest antlered mule deer (bucks).

The trophy zone, BGZ 8, in the southern part of DMA 1 has an authorization draw that limits the number of hunters. The harvest goal is 7 percent of the estimated preseason deer population or 25 percent of the antlered males (about half the 3-point and larger bucks). The benefits of this strategy are a high-quality hunting experience, a high hunter success rate (about 60 percent), more older and larger bucks in the harvest, and few hunter-landowner conflicts. However, the number of people having an opportunity to hunt bucks is less than under a general licence and landowners may not be drawn to hunt mule deer at all with both antlered and antlerless animals on the draw. Although many landowners opposed this hunt in the first few years because they were not drawn, there have been few complaints in recent years.

The second strategy for buck hunting is to have an open season but limit the harvest using a 3-point antler restriction. This applies in most of DMA 1 (BGZs 9, 10, 12), 2 (BGZ 7), and all of DMAs 4 and 5 (Table 19). A specific percentage is not used to set the harvest goal because the 3-point restriction does this. The result is a harvest in the range of 10 percent of the preseason population estimate or about 45 percent of the bucks. The positive benefit of this strategy is that anybody has an opportunity to hunt bucks while at least yearling bucks are protected to ensure breeding. The problems with this strategy are the following: few bucks survive to trophy size, hunters are crowded into the limited habitat (which reduces hunting quality and increases landowner-hunter conflicts), hunter success rates are low (about 18 percent in 1985), the desired harvest in many WMUs is difficult to achieve, and some bucks smaller than 3-points are shot and left so they are wasted.

A third strategy is used in Kananaskis Country within DMA 3 (BGZ 5). The number of hunters is limited using a draw, but a harvest goal percentage is not used because population estimates are not

precise. A conservative number of permits, which ensures a low hunter density and is below 10 percent of the crude preseason population estimate, was chosen and is being monitored. The benefit is a high quality hunting experience, more of the larger bucks, few conflicts between hunters and other outdoor recreational users, and more bucks for nonconsumptive users to see. The only drawback is a reduction in the number of people having an opportunity to hunt.

The fourth strategy is to provide a relatively long open season for bucks, as is the case in DMAs 3 (outside Kananaskis Country), 6, 7, 8 and 9 (Table 19). This only works where escape cover is good and hunting pressure is not too high. A harvest goal does not apply because the open season has little control over the harvest. Based on current harvest estimates and some jaw-derived age information, the harvest in WMUs in these big game zones would be in the order of 20 to 50 percent of the males or 4 to 10 percent of the preseason population. The benefit of this strategy is that all those who want to hunt may do so. The potential difficulty with this strategy is hunter crowding and very high buck harvests in some areas, but this has not been documented yet for mule deer in these zones. If the harvest reached a point where males less than two years old made up more than 60 percent of the males in the harvest, strategies such as the limited-entry draw or 3-point restriction would be considered.

There are only two strategies employed for harvesting female mule deer. The first strategy involves limiting the numbers of hunters for each WMU by using a draw and applies to DMAs 1, 2 and 4 (Table 19). The harvest goal for maintaining the current population level is 12 percent of the preseason population or about 20 percent of the adult does. The 12 percent includes fawns, which constitute 17 percent of the antlerless harvest or 8 percent of the fawn population. The second strategy, employed in DMA 3, is similar to the first, but the harvest goal (permit numbers) is more conservative because the population estimates are not precise and data are not available on how many deer typically move from DMA 3 to winter ranges in DMA 2 by the time the hunting season opens. DMAs 4 (BGZ 11 only), 5, 6, 7, 8 and 9 have no open season for females because population information is not precise and the limited data available suggest there is no harvestable surplus.

The Harvest Information System for Mule Deer - Systematic population inventories are conducted only in DMAs 1, 2, 4 and a small part of 5. Habitat inventories are continuing in DMAs 1, 2, 4 and part of 5 but are not yet complete. It is essential with an incomplete data base like this that the harvest data collection system provide annual information at the WMU level. Harvest data can provide information on the population age and sex structure as well as information on whether the harvest rate is too high or too low in relation to the harvest goal. Past harvest data have been insufficient at the WMU level.

The 1985 hunter harvest phone questionnaire (Alberta Fish and Wildlife 1986) provided sufficiently precise data for some WMUs but not for others. The data collected were useful at the Big Game Zone level and provided information on hunter effort (recreation days), number of deer harvested and hunter harvest success rates. This information is used in conjunction with population inventory data to determine whether harvest goals are achieved, to make adjustments in the harvest and to redirect hunter effort as necessary in the subsequent hunting seasons. In the absence of population inventory data, the information can also be used to estimate numbers of deer in the population.

The age data obtained through jaw collections are an essential part of the harvest information because questionnaires by themselves do not provide information on the population age structure. Age composition of the harvested population provides information on the population as a whole regarding productivity and the effect of current harvest regimes even though there are biases in the jaw samples (e.g., hunters select certain animals or are directed to certain animals by regulations). Lumping of data at the BGZ level is often necessary to obtain sufficient sample sizes. This means the information will not be accurate for some WMUs, but this is acceptable where harvests are controlled only at the BGZ level.

2.4.6.7 Mule Deer Population Management and Non-hunting Mortality

Non-hunting mortality factors that limit the mule deer population are habitat quantity and quality, weather severity, competition with other wild and domestic ungulates for food and cover, predation, parasites and disease, and accidents.

Habitat - The amount and quality of habitat and annual variations in weather severity ultimately determine annual natality, survival and recruitment. Habitat inventory, retention and development programs are covered in Sections 2.4.6.2 and 2.4.6.3.

Weather Severity - Weather severity is monitored in a general way during the critical winter months. The Division has responded to severe winters in a few local areas during some years and in a widespread fashion during the winter of 1984/85 by providing emergency winter feed. This latter program cost $334 000, involved assistance of about 400 volunteers, and reached 7000 of the estimated 190 000 deer (both mule and white-tailed). The Division approach has been to recognize that annual winter mortality is a natural event and intervention should occur only under severe emergency conditions (Gurba and Neave 1979). The use of winter feeding sites to intercept deer and prevent damage of stored livestock forage is one of the techniques used by the Division. These feeding sites act as a supplemental feed source and likely reduce overwinter mortality in the vicinity where they are used.

Competition - Competition with domestic sheep, cattle and horses, as well as other wild ungulates (white-tailed deer, moose and elk) is occurring but the overall impact on mule deer is not well documented. Some of these competitive interactions have been studied in Alberta (Nowlin 1976, Rhude and Hall 1978, Berg 1983). The Division is currently working on programs to minimize competition with domestic livestock for the benefit of mule deer (e.g., forage allotments for both cattle and wild ungulates like mule deer in Integrated Resource Plans). White-tailed deer populations in DMA 1 are being harvested at a much higher rate than mule deer, to ensure they do not take over mule deer range.

Predation - Wolves, coyotes, cougars, lynx and bobcats are known to prey upon mule deer, but their overall impact on mule deer populations, though significant in other parts of North America, is not well documented in Alberta. Mule deer are known to be a preferred prey species for wolves in some parts of the foothills and mountains; wolves

may constitute an important limiting factor in these places. There are no programs presently in place to reduce predators specifically to increase mule deer populations. However, hunting, trapping and agricultural pest control practices (e.g., wolf control in agricultural fringe areas and coyote control on domestic livestock ranges throughout Alberta) probably benefit mule deer in many parts of the province.

Parasites and Diseases - Parasites and diseases of mule deer are monitored by the Division, the universities (particularly the University of Alberta, Zoology Department) and the Provincial Veterinary Laboratories at Fairview, Edmonton, Airdrie and Lethbridge. The only documented disease affecting large numbers of deer was epizootic hemorrhagic disease, which was associated with 18 mule deer and 440 white-tailed deer found dead in southeastern Alberta in 1962 (Chalmers et al. 1964). The cumulative effect of the various parasites and diseases on deer is not documented in Alberta.

Accidental Deaths - Deaths resulting from vehicle collisions are being monitored in a few areas of the province. Reflectors that stop deer from jumping onto roadways at night are currently being tested in the Southern Region. High-pitched whistle devices that are purported to have a similar effect at any time of day are being used by some trucking companies and individuals, but there is no systematic monitoring of the results. Fencing and underpasses have been built along parts of the Trans-Canada Highway in Banff National Park to reduce vehicle collisions.

The new, smooth, concrete-lined irrigation canals in southern Alberta are being monitored because deer have a very difficult time escaping once they have fallen into the canals.

2.4.6.8 Management of Damage Caused by Mule Deer Populations

The section on economics (2.4.5) discusses the incidence of mule deer damage to personal property such as gardens, shrubs, field crops, stored grains and stored livestock forage (stacked feed). The Division uses three major strategies to deal with damage caused by mule deer.

The first strategy involves controlling the damage by increasing

the hunting harvest in the areas of most severe damage. This strategy reduces the problem but does not eliminate it and everybody has a different idea about "how many" deer is a good number to have in any particular locality. This approach is ineffective where there are large blocks of land closed to hunting (e.g., Provincial and Federal Parks, Suffield and private land with no access), from which deer regularly move onto adjacent lands and cause damage.

The second strategy involves preventing the deer from getting to the products that are being damaged. Four different approaches are currently in use. Scaring devices (cannons, shell-crackers, repellants such as Blood Meal, Hinder, Deer-Away, Skoot) are used as short-term deterrents to solve small problems or problems anticipated to be of short duration. Effectiveness is highly variable. Fencing (both temporary snow fence that is portable and easily moved and permanently installed Paige wire) is used to protect stored products such as haystacks and garden patches and shrubs. This is a very effective prevention method. A third approach that is used when other efforts fail is intercept feeding, which stops the deer before they reach the damage site (e.g., haystack) by providing a high quality food at a feeding site between the bedding area and damage location. This may increase winter survival and production but may develop a herd habituated to artificial rather than natural feed. The cost of maintaining such an artificially fed herd is very high so the preferred methods are to discourage the damage and keep the deer on natural forage. Another effective approach that has had limited application (e.g., Buffalo Lake Buck for Wildlife Project) is to enhance the habitat and provide an attractive wintering area with food and cover so the deer are not inclined to use stored feed on adjacent private lands.

The third strategy involves compensation for the damage. Presently, landowners sustaining damage to standing or swathed crops will be paid for a percentage of the crop value up to a maximum per acre. Compensation provides some short-term relief for the landowner, but many situations are not covered (e.g., haystacks, grain piles, gardens, shrubs, orchards) and it does not solve the problem. The intention is to use the compensation for short-term relief until better control and/or prevention techniques can be put in place.

2.5 Management Issues and Future Implications

There have been major advances in the knowledge of mule deer populations in Alberta over the past 30 years. During the same period the consumptive interest in the resource has tripled, exceeding the supply in many areas, and competition for the land base (habitat) has intensified. Several major management issues must be addressed if mule deer populations are to be maintained and increased to meet future consumptive and nonconsumptive public needs.

2.5.1 Recreational Hunting

The harvest of male mule deer must be controlled in some way because they would be overharvested throughout settled Alberta under an open general licence season. Three important elements must be considered when determining the regime to exercise this control: hunting opportunity, hunting quality, and landowners.

The current 3-point antler size restriction allows unrestricted opportunity (i.e., anybody that buys a general mule deer licence can go hunting) and ensures some bucks for breeding. However, under this regime hunting quality is poor (i.e., harvest success rates are below 20 percent, there are none of the larger 4-point bucks in many areas and there is hunter crowding), some landowners are subject to high levels of disturbance (i.e., large numbers of hunters on or near their land) and some smaller bucks are shot and left.

A limited-entry hunt, without the 3-point antler size restriction, would improve the quality of the hunt (i.e., hunter success rates would exceed 30 percent, there would be the larger 4-point bucks in most areas and hunter crowding would be reduced), landowners would be subject to lower levels of disturbance, there would be lots of bucks for breeding and fewer bucks would be shot and left. However, overall opportunity (i.e., numbers of hunters) would initially be reduced to less than half what there is now. There would also be some landowners each year who would be unable to hunt mule deer on their property because both antlered and antlerless animals would be on a limited-entry draw.

The implementation of a limited entry harvest regime as described would result in the shifting of some hunting pressure to species like

white-tailed deer and elk. The resulting increased effort toward these species will have to be monitored closely to identify potential over-harvest situations.

The current system employed to produce trophy-sized bucks in the southern portion of DMA 1 (Big Game Zone 8) is a limited-entry and a 3-point antler size restriction. The 3-point antler size restriction means that hunters do not harvest yearlings (the age group having the greatest number of antlered deer) but instead focus their attention on bucks two years old and older. If the 3-point rule were removed, some hunters would take yearlings (even though it is a trophy area) and lower the harvest on older bucks. The greater escapement of older bucks would lead to more trophy-sized deer in the system as long as harvest rates remained as low as they are now.

2.5.2 Habitat Retention and Enhancement

The precision of current mule deer habitat inventory (mapping and assessment of suitability) is inadequate. Initial emphasis should be on completion of suitable inventories in the prairie, parkland, foothills and Peace River regions followed by the forest reserves which would likely be done in conjunction with other species. Adequate habitat inventories will then allow more accurate goal setting for habitat and populations at the WMU level and will provide a better focus for habitat retention and enhancement programs.

The retention of mule deer habitat on privately owned and leased public land is essential for the prairie, parkland, foothills, Peace River and agricultural fringe regions, where over two-thirds of the mule deer population resides. This is particularly critical in the parkland and northern agricultural fringe where mule deer populations have declined significantly in the last three decades. Habitat enhancement can mitigate small habitat losses and provide for modest population increases, but the long-term existence of mule deer will depend on the retention program.

A third focus should be on the provision of additional habitat through habitat enhancement to mitigate losses to other land uses and provide for a modest deer population increase to meet future needs. Mitigative efforts should occur wherever the need is identified, but

enhancement for population increases should occur in the eastern slopes, parkland and agricultural fringe regions.

2.5.3 Population Management

Improved precision of information regarding mule deer population size, distribution, age/sex structure and productivity at the WMU level in the prairie, parkland, foothills and agricultural fringe regions and at the zone level in the rest of the province, will allow more precise population management and an increase in overall recreational opportunity.

Secondly, the location and magnitude of illegal harvest, which may be an important limiting factor in some areas (the parkland and agricultural fringe would be areas to focus initially), should be identified.

2.5.4 Protection of Property

Currently deer damage on private land is addressed through programs that reduce deer numbers (e.g., hunter harvest levels are adjusted to reduce damage), prevent damage (e.g., scaring devices, temporary and permanent fencing, intercept feeding sites), and compensate losses by paying for damage to standing and swathed crops in the field. However, damage losses are still extensive in some years. Expansion of the compensation program to crops presently not covered and use of non-monetary compensation (e.g., range improvement to benefit both deer and domestic livestock) may encourage private landowners to retain deer habitat and allow recreational use of the resource in the future.

2.5.5 The Future

Failure to address these major management issues will result in the long-term decline of mule deer habitat, populations and both consumptive and nonconsumptive recreational opportunity. The following "Management Plan" incorporates the desirable features of the current management program and addresses the management issues outlined here. It is intended to reflect the needs for mule deer management over the next 10 years.

3.0 MANAGEMENT PLAN

3.1 Policy Framework

The Fish and Wildlife Policy for Alberta (Alberta Fish and Wildlife 1982), under the subject of the Wildlife Policy, established policy goals for the administration of wildlife resources in Alberta. Some of these policy goals provide a framework for the formation of specific mule deer management plan goals and are set out under five general categories.

1. **Resource Protection**

   "1) ... The primary consideration of the Government is to ensure that wildlife populations are protected from severe decline and that viable populations are maintained."

2. **Resource Allocation**

   "2)(a) The wildlife resource, as a Crown resource, will be utilized in a manner which contributes the most benefit to the citizens of Alberta."

   "2)(e) Wildlife will be allocated through a defined process whereby specific resources are deployed to specified uses in order to achieve stated public benefits."

   "ii) The Division may allocate live wildlife for various uses such as game farming, game ranching, education or science and zoological displays, in conformity with other aspects of the Wildlife Policy."

"17) Wildlife must be allocated among different primary users in response to government policy. Until such time as supply and demand can be better rationalized, the following interim allocation guidelines will prevail in order of priority:

... (b) Resident recreational use of game will have precedence over non-resident use. Wildlife stocks not fully allocated or utilized to higher priority uses may be allocated commercially to non-residents."

"18) The allocation of wildlife stocks to the different primary uses does not imply that other uses cannot occur within areas where such uses are entitled."

3. Recreational Use

"8) A variety of wildlife recreational opportunities, in addition to hunting, will be available for the benefit and enjoyment of Albertans."

"21) A variety of hunting opportunities will be available for the recreational benefit and enjoyment of Albertans ...."

4. Commercial Use

"22) The Division will encourage an environment that promotes the growth of the tourist industry ...."

5. Protection of Private Property

"4) The Government, through the Division, will assist in preventing or controlling wildlife from damaging property and endangering human life."

"5) Responsibility for damage in any form caused by wildlife will be shared in relationship to what people can reasonably do for themselves and to the amount of any additional damage beyond that which would normally be expected to occur in any area."

3.2 Management Goals and Objectives

3.2.1 Resource Allocation

Goal: To maximize benefits to Albertans through the optimum allocation of the mule deer resource.

Objectives:

a) Provide a variety of recreational hunting opportunities to 49 100 residents that result in a harvest of 17 260 mule deer annually by the year 1996.

b) Provide a variety of opportunities to 1.5 million Albertans to spend 80 million days on directly related nonconsumptive wildlife* activities.

c) Provide an opportunity for Treaty Indians (in accordance with Paragraph 12 of the Natural Resources Transfer Agreement) and other Albertans (in accordance with the provisions of a subsistence hunting licence) to meet their subsistence food needs.

d) Provide an economic return to outfitters, guides and other Albertans providing goods and services by providing the opportunity for non-resident hunters to hunt male mule deer.

e) Provide an opportunity for big game farmers to possess and propagate mule deer for public display and sale to other licenced big game farms.

f) Promote and encourage scientific and educational activity that will enhance our knowledge of mule deer and thus improve management capabilities.

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*"Nonconsumptive wildlife" goals and objectives are not developed by species so this objective includes all wildlife species involved in nonconsumptive activities, not just mule deer.

3.2.2 Recreational Use

Goal: To maximize the recreational benefits and enjoyment to Albertans from the mule deer resource through the provision of a variety of types and amounts of recreational opportunities.

Subgoals:

1. To provide the maximum opportunity to hunt male mule deer in a quality hunting situation where hunter densities will not exceed 2/km^2 of deer habitat, and there will be a chance to shoot a 4-point buck.
2. To provide the maximum opportunity to hunt trophy (four points or better) mule deer in a very high quality hunting situation where hunter densities will not exceed 1/km^2 of deer habitat, and there will be a chance to shoot a large 4-point buck.
3. To provide the maximum opportunity to hunt antlerless mule deer.
4. To provide the maximum opportunity to hunt mule deer with a bow and arrow.
5. To provide a variety of opportunities for directly related nonconsumptive wildlife* activities (viewing, photographing, studying, feeding, improving habitat for) to all Albertans.

Objectives:

a) Provide the opportunity for 29 600 residents to hunt 138 000 days (with weapons other than a bow) and harvest 8710 antlered (male) mule deer with hunter success rates from 20 to 40 percent depending on the area.

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*"Nonconsumptive wildlife" goals and objectives are not developed by species so this objective includes all wildlife species involved in nonconsumptive activities, not just mule deer.

b) Provide the opportunity for 3300 residents to hunt 18 000 days and harvest 800 antlered (male) mule deer in a trophy area with hunter success rates from 20 to 55 percent depending on the area.

c) Provide the opportunity for 11 200 residents to hunt 28 000 days (with weapons other than a bow) and harvest 7250 antlerless (females or fawns) mule deer with hunter success rates from 30 to 65 percent depending on the area.

d) Provide the opportunity for 5000 residents to hunt 30 000 days with a bow and harvest 200 antlered and 300 antlerless mule deer with a hunter success rate of 10 percent.

e) Provide the opportunity for 1.5 million Albertans to spend 80 million days on directly related nonconsumptive wildlife* activities.

3.2.3 Commercial Use

Goal: To provide an opportunity for Albertans to benefit economically from the commercial use of the mule deer resource.

Subgoals:

1. To provide an optimal opportunity for Albertans to benefit from the outfitting and guiding of non-resident mule deer hunters.
2. To assist big game farmers in establishing a mule deer herd.

*"Nonconsumptive wildlife" goals and objectives are not developed by species so this objective includes all wildlife species involved in nonconsumptive activities, not just mule deer.

Objectives:

a) Provide an opportunity for outfitters, guides and other Albertans providing goods and services to benefit economically from non-resident hunting of male mule deer. The number of mule deer allocated to the non-resident harvest will be determined during implementation of the Non-resident Big Game Outfitting and Guiding Policy.

b) Provide up to six mule deer (based on availability) on a one-time basis to big game farms.

3.2.4 Subsistence Use

Goal: To provide an opportunity for Treaty Indians (in accordance with Paragraph 12 of the Natural Resources Transfer Agreement) and other Albertans (in accordance with the provisions of a subsistence hunting licence) to meet their subsistence food needs.

3.2.5 Science and Education

Goal: To promote and encourage scientific and educational activity that will enhance our knowledge of mule deer and thus improve management capabilities.

3.2.6 Protection of Property

Goal: To minimize property damage caused by mule deer.

Objective:

Keep the annual damage by mule deer below $100 000.

3.2.7 Population and Habitat

Goal: To ensure that mule deer populations and habitat are managed to meet the resource requirements needed to achieve the recreational and economic goals and objectives.

Objectives:

a) Increase the average preseason mule deer population (keeping in mind that annual numbers may fluctuate above and below this mean because of environmental factors such as winter weather) from the current estimate of 86 000 to 97 000 by 1996 (Table 20).

b) Provide sufficient habitat, 48 500 km^2 of summer range and 17 710 km^2 of winter range, to support a summering population of 97 000 mule deer and a wintering population of 70 810 mule deer (Table 21).

3.3 Management Strategies

3.3.1 Population Management

The mule deer population will be managed, through a variety of harvest regimes, to provide recreational hunting opportunities, an opportunity for widespread nonconsumptive enjoyment, and an opportunity for Albertans to benefit from guiding non-resident mule deer hunters.

3.3.1.1 Male Harvest Regime

Males (bucks) will be harvested using two strategies:

Maximum sustained yield - The harvest is set at 11 percent of the estimated preseason population. This results in a harvest of 51 percent of the antlered males, leaving a reasonable mix in age structures after the hunting season.

Restricted male harvest - The harvest is set at 5 percent of the estimated preseason population. This results in a harvest of 24 percent of the antlered males, creating an increased chance for a larger "trophy" buck to be harvested.

3.3.1.2 Antlerless Harvest Regime

The antlerless harvest will be managed using three strategies:

Maximum sustained yield - The harvest is set at 12 percent of the estimated preseason population. This results in a harvest of 23 percent of the yearling and adult females and 13 percent of the fawns. This strategy is employed in the most productive habitats where other

Table 20. Mule deer population, recreation and harvest goals for 1996.

Deer Management Area	1985 Preseason Population Estimate	1985 Hunter Recreation Days	1985 Harvest		1996 Preseason Population Goal	1996 Hunter Recreation Days Goal	1996 Harvest Goal	
			Antlered (bucks)	Antlerless (does/fawns)			Antlered (bucks)	Antlerless (does/fawns)
1	27 000	42 000	3 054	3 240[b]	27 000	35 000	2 670	3 240
2	16 500	48 000	2 069	1 629	20 000[b]	39 000	2 200	2 400
3	9 500	25 000	571	189	11 000[b]	26 000	550	550
4	8 000	44 000	1 155	960[b]	9 000[b]	17 000	990	1 080
5	5 000	22 000	404	41	7 000[b]	19 000	770	0
6	7 000	55 000	1 131	Closed	10 000[b]	33 000	1 100	0
7	3 000	9 000	291	Closed	3 000	10 000	330	0
8	5 500	15 000	518	Closed	5 500	20 000	600	280
9	4 500	2 000	48	Closed	4 500	15 000	500	0
TOTAL	86 000	262 000	9 241	6 059	97 000	214 000	9 710	7 550

[a]The figures used here are lower than the estimated 1985 harvest (5476 in DMA 1 and 1261 in DMA 4) because the purpose of this table is to compare the harvest in 1985 and 1996 using similar harvest rates. The actual 1985 harvest rate was higher than the 12 percent used in 1996 because the goal was to reduce the population.

[b]The goal is to increase the population in these Deer Management Areas above the 1985 level.

Table 21. Habitat goals to meet the 1996 population goals.

Deer Management Area	1996 Summer Population Goal	1996 Winter Population Goal	Area of Habitat Required(km^2)	
			Summer Range[a]	Winter Range[b]
1	27 000	19 710	13 500	4 930
2	20 000	14 600	10 000	3 650
3	11 000	8 030	5 500	2 010
4	9 000	6 570	4 500	1 640
5	7 000	5 110	3 500	1 280
6	10 000	7 300	5 000	1 830
7	3 000	2 190	1 500	550
8	5 500	4 015	2 750	1 000
9	4 500	3 285	2 250	820
TOTAL	97 000	70 810	48 500	17 710

[a]It was assumed that the average density on summer range is 2 mule deer/km^2.

[b]It was assumed that the average density on winter range is 4 mule deer/km^2.

mortality factors such as winter weather and predation are thought to be less severe. The harvest rate may be adjusted upward or downward to achieve population reduction or growth to meet population goals. Upward adjustments will be limited by a maximum allowable hunter density of 2 hunters/km^2 of deer habitat to minimize landowner disturbance and maintain a quality hunting experience. Further population reductions would require additional time periods to hunt. Downward adjustments in the harvest rate will be 3 percent for every 10 percent drop (below the goal level) in the preseason population estimate. This means there will be an antlerless season closure when the preseason population is at or below 60 percent of the desired preseason population goal.

Restricted antlerless harvest - The harvest is set at 5 percent of the preseason population. This results in a harvest of 9 percent of the yearling and adult females and 4 percent of the fawns. This strategy is employed in reasonably productive habitats where other mortality factors are thought to be more severe and population/habitat inventory data are not precise. Upward adjustments will be limited using the same modifications outlined under "maximum sustained yield". Downward adjustments in the harvest will be 1 percent for every 10 percent drop (below the goal level) in the preseason population estimate. The antlerless season will be closed when the preseason population falls at or below 60 percent of the desired goal.

No harvest of antlerless animals - This will be used in areas of moderate to low productivity where other mortality factors are thought to be taking the annual increment and population/habitat data are not precise.

The antlered and antlerless harvest regimes are derived from the population model presented in Appendix III and are based on certain assumptions that require more testing in the future.

3.3.2 Licencing and Use Management

3.3.2.1 Recreational Hunting of Antlered Mule Deer

Antlered mule deer will be hunted using two strategies:

General mule deer licence - It will be valid in any area where there is an open season for bucks and no requirement for a special licence.

These areas have traditionally had relatively low hunting pressure and a small harvest. If yearlings begin to increase as a percentage of the male harvest in these areas and exceed 60 percent of the male harvest for two years, then a special licence draw should be used.

Special antlered mule deer licence - It will be used in all Wildlife Management Units where there would be an overharvest of males or a very unbalanced sex ratio under a general licence. Hunters will be selected using a draw. If the number of applicants is greater than two times the number of licences available, a priority system or wait-out period for special licence holders should be implemented to ensure an equitable distribution of opportunity among all interested hunters. Another method to consider for reducing the demand for this licence would be to have it as one of a list of special licences (e.g., place it in with moose and elk special licences).

3.3.2.2 Recreational Hunting of Antlerless Mule Deer

Antlerless mule deer will be hunted using only one strategy:

Special antlerless mule deer licence - It will be used in all Wildlife Management Units where there is a harvestable surplus of females and fawns. The rest of the Wildlife Management Units will be closed to the hunting of antlerless animals. Hunters will be selected using a draw. Initially, there will be no wait-out for this draw but this should be reviewed in 1990.

A hunter may not have more than one of a general mule deer licence, a special antlered mule deer licence and a special antlerless mule deer licence in the same year. Archers will be subject to the draws when the overall bow hunting harvest is estimated to exceed 5 percent of the annual harvest in the area.

3.3.2.3 Outfitting and Guiding

The provision of an abundant and widely distributed mule deer population will benefit the outfitting/guiding industry as well as tourism in general. The number of mule deer allocated for non-resident use will be determined during implementation of the Non-resident Big Game Outfitting and Guiding Policy.

3.3.2.4 Game Farming

Game farms will be licenced under regulations that ensure that mule deer are held and propagated in a safe, healthy and humane manner that keeps them separated from free-ranging wild herds. The Alberta government may provide (for a prescribed fee) up to six mule deer on a one-time basis to each big game farm operator to help them get started. This will be based on availability of animals.

3.3.2.5 Nonconsumptive Use

The entire mule deer population is available for nonconsumptive use at any time even though some animals have been allocated for consumptive use and will be removed during the hunting season. The main strategy therefore is to enhance the opportunity for the public to interact with the mule deer herd. This will be accomplished by the following:

1. maintaining a widely distributed and visible mule deer population,
2. enhancing specific habitat near or in urban centres and major recreation developments to concentrate mule deer for viewing,
3. maintaining existing areas (e.g., parks, wildlife sanctuaries) where there is no mule deer harvest, and
4. enlisting the help of the public in mule deer management programs such as habitat enhancement, deer damage prevention and population and habitat inventory and more general programs such as "Use Respect".

3.3.3 Hunting Seasons

Hunting seasons will start after summer nonconsumptive outdoor recreation uses have decreased in early September and before the onset of severe winter stress in mid-December. Opening and closing dates will be common over large areas to disperse hunting pressure. There will be a province-wide general "archery-only" season prior to the regular season. Seasons will be the longest (up to 80 days) where the deer are least vulnerable and hunting pressure is relatively low. Seasons will decrease in length as vulnerability and hunting pressure increase with the shortest seasons (up to 24 days) occurring where hunting pressure is high, the deer are very vulnerable and most of the deer hunting is

concentrated on private land. The shorter seasons will occur in November. Season length is not sufficient to control the harvest of mule deer over much of Alberta so a draw (special licence) must be used. This controls the harvest, maintains a reasonable hunter density and protects landowners from extremely high hunter densities that would occur during an open general season.

A zone for archery-only hunting of mule deer will be maintained, particularly in areas where numbers of deer and recreational demand are high but the use of high-powered rifles is not advisable because of the high density of residential dwellings.

The Camp Wainwright deer season will be continued with one three-day primitive weapons hunt and four three-day rifle seasons and will continue to be a limited entry hunt with a special licence and hunter selection through a draw. A priority system or one-year wait-out for this special licence will be considered if demand for this licence exceeds two times the number of licenses available for two consecutive years.

3.3.4 Anticipated Hunter Success Rates

Hunter success depends on how many animals there are in a given area, how available the animals are (i.e., road and trail access, visibility in the vegetation and/or terrain, and permission to hunt on private land), and the timing and length of the season (i.e., weather, relative to rut, and leaf fall or not). Deer populations and seasons will be managed so that hunters can expect a range of 20 to 50 percent success while hunting bucks and a range of 50 to 65 percent success while hunting antlerless animals.

3.3.5 Extension

3.3.5.1 Hunter Education

The Alberta Conservation and Hunter Education program should continue to address its broad spectrum of topics such as hunting ethics, wildlife identification and management, firearm use and safety, field hunting and game handling techniques, and survival/first aid techniques. When dealing with mule deer, the emphasis should be on firearm safety in

settled areas, respect for private property, the field recognition of differences between mule deer and white-tailed deer, the humane kill of the animal, the proper care and handling of the carcass, and a summary of the management goals, objectives and strategies for mule deer in Alberta. The latter will require an expansion of the current "wildlife management" section to the species level. Ongoing programs such as "Use Respect", that provide an annual emphasis on certain aspects of the Hunter Education program, should be continued. A summary of the management goals, objectives and strategies for mule deer should be available to the public as well as an annual summary of the current year's hunter harvest and effort and the mule deer population status.

3.3.5.2 Nonconsumptive Use

Public awareness of the mule deer resource will be increased by providing the following:

1. written material on the natural history and management challenges for mule deer in Alberta, and
2. a mule deer viewing guide (to be incorporated with a number of other wildlife species in a more comprehensive guide).

3.3.6 Habitat Management

Habitat sufficient to meet the provincial and local goals will be provided as a result of retention programs on private and public land and by increasing the carrying capacity of some habitat to mitigate habitat losses and other habitat to increase the herd to meet future goals.

3.3.6.1 Habitat Retention

The steps involved in a habitat retention program are as follows: Inventory - Habitat inventory and habitat retention goals must be established for each Wildlife Management Unit. Inventory will be covered in Section 3.3.10.2, which follows. Habitat retention goals by Deer Management Area are outlined in Table 21, but await completion of inventory before they can be set at the Wildlife Management Unit level. Integration - Habitat retention goals for mule deer must be integrated with other wildlife species and other uses of the land base.

Integration is accomplished through participation in regional and local planning on private land (e.g., Regional Planning Commission Plans and local Municipality Land Use Plans and Bylaws) and public land (e.g., Integrated Resource Plans and River Basin Plans).

Application - Specific retention goals must be applied to small parcels of private and public land. On private land this must occur through land use plans and agreements with individual landowners. The agreements will recognize the landowner for retaining important mule deer habitat and provide some form of reward for doing so. If Class 1 or 2 mule deer habitat on private land is threatened and cannot be protected through agreement (i.e., the landowner does not want to participate in the retention program and has indicated a desire to remove the habitat) and there is little chance of mitigating the loss, then purchase should be considered.

Application of habitat retention goals on public land occurs through the government land use referral process. Referrals may result in a standard condition to protect habitat or individual recommendations for each referral regarding habitat retention during land use activities such as timber harvesting, agricultural expansion and intensification, oil and gas exploration and development, transmission line and transportation corridor development, recreation development, mining exploration and development, thermal power generation development, development of dams for flow regulation and hydropower, and urban expansion. Guidelines to maintain quality mule deer habitat generally involve restrictions on the type and level of use, restrictions on the location or time period of use, and controls on the type of public access to the development site. If the important habitat for mule deer has not been identified in a planning document the referral agencies use, then it should be flagged with an appropriate Fish and Wildlife Reservation. If referrals are not successful in retaining habitat, then the loss should be mitigated via habitat enhancement in another location.

3.3.6.2 Habitat Enhancement

Habitat enhancement, i.e., increasing the carrying capacity of a unit of land, may take place on private or public land but the latter would have priority. The highest priority for habitat enhancement for

mule deer should be parcels of public land in areas where habitat loss is occurring on private land and where crop damage is severe on private land. The next priority should be public land in Wildlife Management Units where the goal is to increase the deer population by 1996. The greatest potential for habitat enhancement exists in areas of the foothills and forest fringe where a mosaic of irregular agricultural development and cooperative forage enhancement programs would benefit both deer and livestock, and in areas where timber harvesting is occurring. The best mix of food and cover types in combination with slope and aspect will vary depending on the ecoregion of the province. Site specific plans will have to be developed for each enhancement project by extracting the appropriate food and cover needs for the area out of the habitat requirements summary prepared by Nietfeld et al. (1985).

3.3.7 Predator Management

Since wolves, coyotes, bears, cougars, lynx and bobcat are known to take mule deer, the first step should be to determine the impact of predators on the mule deer population. The priorities for examining this problem should be bobcats and coyotes in the prairie ecoregion, coyotes in the parkland and foothills, and wolves and bears in parts of the boreal mixedwood, foothills and uplands. Until the impact of predators is better understood, there will be no predator management program designed specifically to benefit mule deer.

3.3.8 Other Mortality Factors

3.3.8.1 Winter Mortality

The length of winter, depth of snow and number of days with very cold temperatures have a profound effect on survival and spring fawn production. These climatic features will be monitored to produce a winter severity index. If a significant winter die-off is predicted, a winter feeding program will be considered for mule deer.

3.3.8.2 Parasites and Disease

Parasites and diseases are not known to cause significant mortality in Alberta mule deer, but monitoring should be continued by examining

carcasses submitted by hunters, landowners and district and regional staff. Staff should continue to seek the assistance of university and Provincial Veterinary Laboratory staff who specialize in the identification and diagnosis of parasites and diseases of wildlife.

3.3.8.3 Accidental Deaths

Accidental deaths for mule deer in Alberta probably number in the hundreds and may even reach a few thousand, but the sites of these deaths are widely dispersed making management solutions impractical. The one area that should be monitored is deaths caused by vehicle collisions. The effectiveness of warning reflectors and high-pitched whistle devices should be investigated. The small number of collisions in any one locality limits the practicality of fences and underpasses, but such features may become desirable in the future as traffic increases through important deer habitats.

3.3.8.4 Treaty Indian Harvest

The harvest by Treaty Indians (in accordance with Paragraph 12 of the Natural Resources Transfer Act) is not known. It would be useful to document this harvest as it may be locally important, but there is currently no practical method to obtain this information.

3.3.8.5 Illegal Harvest

The illegal harvest likely numbers in the thousands. Effort should be directed at getting better information on the illegal harvest and should concentrate initially in the parkland and boreal fringe where the problem is felt to be the most significant. Current levels of enforcement should be maintained until the magnitude of the problem and specific locations are identified.

3.3.9 Protection of Private Property

The Division will operate a damage prevention, control and compensation program to minimize damage to crops, pasture, stored grain and forage, orchards, gardens and shelterbelts on private land.

3.3.9.1 Prevention

The prevention component involves four different approaches:

Scaring devices - Scaring devices (cannons, shell-crackers, microwave-detector scaring devices) or repellents (bloodmeal, commercial repellents such as Hinder, Deer-Away, Skoot) may be used to keep the deer away. Effectiveness varies considerably between areas and herds of deer; furthermore, these are not long-term solutions.

Fencing - Fencing which may be permanent (2.1 m high Paige wire) or temporary (1.2 m to 1.5 m high snow fence) may be used to keep deer out. These approaches are very effective but have relatively high initial costs and can only be used on relatively small areas such as feed stacks.

Intercepting - Deer may be intercepted before they get to the damage site by providing a high quality food alternative at a feeding site. This practice is effective, like fencing, but may have the added benefit of increasing overwinter survival.

Luring - Deer may be lured away from the damage site by providing alternate forage sites on public land or leased land where the habitat has been enhanced to produce an attractive food source. This method has worked well elsewhere but has had limited application in Alberta to date.

3.3.9.2 Control

The control component has three possible approaches:

Hunting - Hunting may be used to maintain herds at levels acceptable to landowners. In many instances there have been season extensions, two tags or extra quota licences specifically designed to reduce deer herds. Landowners need to be involved in the season setting/permit number setting process for it to be effective. Hunting is most effective if used in combination with prevention techniques.

Trapping and relocating - This has not been used recently for deer in Alberta, provides only temporary relief and is very expensive.

Kill permits - Kill permits may be issued to remove offending animals. It would be used only as an absolute last resort if no other solution is feasible.

3.3.9.3 Compensation

The compensation component involves the payment of a percentage of the crop value to compensate for crop losses. Present coverage includes only standing or swathed crops, but not stacked or stored crops, orchards, nurseries or gardens. This policy is currently being reviewed and extension of payment to presently unincluded crops has been recommended as a means to gain landowner support for mule deer management goals. Compensation does provide relief for the landowner, but does not resolve the depredation problem and should be considered only until a proper prevention (e.g., fencing) and/or control (e.g., increased harvest) solution is employed. It should be used as a long-term solution only where the natural habitat is deficient and preventive measures are not feasible. However, if the compensation was to take the form of on-farm habitat enhancement (e.g., watering site development and fencing to implement rest-rotational grazing), which benefits the deer while causing no loss to livestock, this would be a desirable long-term solution to resolving the deer problem.

3.3.10 Population and Habitat Inventory

Population inventory provides the necessary information on distribution, density, age/sex ratios, productivity and condition of animals that is essential to meet the resource management and allocation goals for this species. Habitat inventory provides the necessary information on food and cover, which are two of the major factors influencing distribution, density, productivity and condition of the animals in the population.

3.3.10.1 Population Inventory

Population inventory involves direct methods where the deer are actually observed (e.g., aerial survey) and indirect methods (e.g., jaw collection, harvest questionnaires). Direct methods can provide all the necessary population information but are often impractical because of cost or poor visibility of animals in dense cover types. Indirect methods supplement direct methods or replace them in areas where direct methods are not feasible, but the usefulness of indirect methods is limited because they can provide information only on distribution and

age/sex ratios. The techniques used for mule deer population inventory will be as follows:

Aerial surveys - Aerial surveys are the only practical direct population inventory method to use in Alberta because of the large geographic area, highly dispersed deer herd, limited manpower and suitability of the vegetation and terrain to survey. The three types of aerial surveys needed for deer in Alberta are line transects, blocks and stratified quadrats.

Line transects are used for reconnaissance surveys where the intent is to assess the habitat and deer distribution to determine the most suitable long-term survey method. Line transects are also used as the primary survey method if habitat is not yet mapped and stratified or the interspersion of vegetation types does not allow the use of blocks or stratified quadrats.

Blocks are used when the habitat occurs in irregular localized patterns of similar vegetation types (e.g., prairie rivers).

Stratified quadrats are the preferred method if the habitat has been mapped and stratified and the vegetation and terrain allow the identification and location of square mile quadrats.

The priority for aerial surveys is based on the potential of a Wildlife Management Unit to provide recreational hunting and the feasibility and reliability of the survey. The Wildlife Management Unit is the focus for habitat and population inventory. In the identified high priority Wildlife Management Units, the surveys should be flown biannually using a helicopter with sampling of a sufficient intensity to produce a population estimate accurate to the plus or minus 20 percent level of precision. Helicopters are essential for all surveys where age/sex data are collected or where the terrain or technique make the use of fixed-wing aircraft unsafe. However, if the terrain is safe, fixed-wing aircraft are suitable for reconnaissance surveys or late season (January 15 - March 31) surveys when age/sex data are not reliable. Those WMUs not in the high priority category should be flown once every five years to maintain information on distribution and numbers of deer. These surveys should be flown in conjunction with the five-year habitat inventory updates wherever possible.

Jaw collection - Jaws should be collected from hunter kills province-wide with highest priority given to areas where aerial survey is not feasible.

Harvest questionnaire - Although the main reason for harvest questionnaires is to determine hunter effort and annual harvest, they also aid in determining animal distribution and trends in age/sex ratios, especially in combination with jaw collections, which provide trend data within different age groups in the population.

3.3.10.2 Habitat Inventory

Habitat inventory allows habitat stratification, which is used as the basis for population inventory, provides a local focus for habitat retention and enhancement programs, and provides information on expected populations. Expected population data can be compared to observed population data and used to estimate populations in areas where population data are not available or to develop management prescriptions to bring observed populations closer to expected levels.

Habitat inventory should be conducted province-wide at a scale that focuses on the species' home range (about 2 km^2). This will mean identification of deer food and cover types as well as important landforms in the size range of 5 ha to 10 ha and mapping at a generalized scale of 0.5 km^2 to 1.0 km^2, using a habitat mapping and assessment techniques similar to those outlined in Appendix II. The priority for conducting inventories would be based on the need to set up a population monitoring program, recreational contribution of the Wildlife Management Unit in a provincial context, security (rate of loss) of the habitat, and level of need in areas where population inventory is not feasible. The habitat inventory should be updated every five years or more often if land use is changing rapidly.

3.3.11 Summary of Goals and Strategies by Deer Management Area

The strategies for the recreational hunting harvest regime, types of licences, hunting seasons, anticipated hunter success rates and number of licences available in each Deer Management Area are outlined in Table 22. These strategies should be implemented for the 1988 hunting season and reviewed in 1990; however, the number of licences

Table 22. The proposed harvest regime, licence types, hunting seasons, anticipated hunter success rates and number of licences available for recreational mule deer hunting in Alberta.

Deer Management Area	Type of Deer Hunted	Harvest Regime as a Percent of the Preseason Population	Licence Type	Season		Anticipated Hunter Success Rates (%)	Number of Licences Available
				Length (days)	Time (months)		
1	Buck	11[a]	Special	24	November	40[b]	6500
	Doe/fawn	12	Special	24	November	65	5000[c]
2	Buck	11	Special	24	November	35	6300[c]
	Doe/fawn	12	Special	24	November	50	4800[c]
3	Buck	5	Special	65	Sept.-Nov.	20	2800[c]
	Doe/fawn	5	Special	65	Sept.-Nov.	30	1800[c]
4	Buck	11	Special	24	November	35	2800[c]
	Doe/fawn	12	Special	24	November	55	2000[c]
5	Buck	11	Special	24	November	20	3900[c]
	Doe/fawn	Closed	-	-	Closed	-	Closed
6	Buck	11	General	72	Sept.-Nov.	20	5500
	Doe/fawn	Closed	-	-	Closed	-	Closed
7	Buck	11	General	65	Sept.-Nov.	20	1600
	Doe/fawn	Closed	-	-	Closed	-	Closed
8	Buck	11	General	72	Sept.-Nov.	20	3000
	Doe/fawn	5	Special	72	Sept.-Nov.	50	600[c]
9	Buck	11	General	80	Sept.-Nov.	20	2500
	Doe/fawn	Closed	-	-	Closed	-	Closed

[a]The harvest rate for part of this DMA (Big Game Zone 8) will be 5 percent to yield trophies.

[b]Part of this Deer Management Area (Big Game Zone 8) will have a success rate of 55 percent.

[c]These licences are available only through the draw which will provide 22 300 buck and 14 200 antlerless special licences by 1996.

available will not reach the maximum until planned population increases have been reached. The nonconsumptive use strategies of providing public information, enhancing viewing opportunities and involving people in management activities will occur in all Deer Management Areas but will be quite limited in DMAs 3, 7 and 9.

The habitat retention program will be applied to private and public lands in all Deer Management Areas, but is particularly important in DMAs 1, 2, 3, 4, 5 and 6 which either provide very high levels of recreation (1, 2, 3 and 6) or are the focus of planned population increases (2, 3, 4, 5 and 6). The habitat enhancement program will occur in a mitigative context in all DMAs but is particularly important for meeting planned population increases in DMAs 2, 6, 5, 3 and 4 (in decreasing order of priority).

The predator management strategy is to obtain more information on the impact of coyotes and bobcats in DMA 1, coyotes in DMAs 2 and 4, and wolves and bears in DMAs 5, 6 and 7.

When conditions dictate an emergency winter feeding program, larger herds in all DMAs except 7 and 9 will be considered for feeding.

Parasites and diseases will be monitored as suspected carcasses are received from the public and division staff in all DMAs, but there will be no attempt to systematically collect animals for this purpose.

Accidental deaths, particularly from vehicle collisions, will be monitored and the effectiveness of new warning devices will be tested.

The extent and locations of significant illegal harvest must be determined before enforcement efforts to control such harvest can be increased. Initial efforts to determine the extent of the problem should concentrate in DMAs 4 and 5.

Private property, mainly DMAs 1, 2, 4, 5 and 8, will be protected from mule deer damage through prevention, control and compensation programs. Prevention will include scaring, fencing, intercept feeding and habitat enhancement. Control will include use of hunting to limit the size of the population and as a last resort the relocation or killing of the offending animals. Compensation for specified types of damage will include monetary payments or habitat enhancement that benefits both the deer and domestic livestock; however, the intent is to switch to a prevention technique subsequently.

Population inventory strategies are summarized in Table 23. Aerial surveys will be flown every second year, during the month of December if possible, and using a helicopter. Line transect surveys, not shown in Table 23, will be used for reconnaissance level surveys to set up blocks or stratified quadrats for the future. Habitat inventory is necessary in all DMAs with the highest priority being 1, 2 and 4. The next priorities in decreasing order of importance would be DMAs 5, 3, 8, 6, 7 and 9.

Table 23. Mule deer population inventory strategies and the types of data obtained as a result of these inventories.

Survey Type and Data Obtained	Deer Management Area								
	1	2	3	4	5[a]	6	7	8[a]	9
Aerial Survey Type:									
Stratified Quadrat		*		*	*			*	
Total Block Coverage	*								
Jaw Collections	*	*	*	*	*	*	*	*	*
Data Obtained:									
Density	*	*		*					
Distribution	*	*	*	*	*	*	*	*	*
Age/Sex Ratio	*	*	*	*	*[b]	*[b]	*[b]	*[b]	*[b]
WMU Population Estimate	*	*		*					

[a]Aerial surveys are only feasible in some of the Wildlife Management Units in this Deer Management Area.

[b]Jaw collection provides only male ages as there is no female harvest.

4.0 MANAGEMENT PLAN APPLICATION

4.1 Provincial Summary

The major management challenges for mule deer are to increase both the population and the recreational opportunity, to retain and develop sufficient habitat to meet population goals, to improve the quality of recreational hunting on private land and to minimize damage to private property.

The summer (preseason) population goal for 1996 is 97 000 mule deer compared to the 1985 estimate of 86 000. Population increases will occur on public land in the southern foothills and mountains, the parkland, the forest agricultural fringe and the Rocky/Edson/Whitecourt forests (DMAs 2, 3, 4, 5 and 6), through a combination of cooperative range improvement and timber harvesting programs and specific habitat development projects for mule deer, with emphasis on the first two programs. Major efforts will have to be made to retain habitat on private land in the prairie, parkland and forest agricultural fringe (DMAs 1, 2, 4 and 5); these efforts will be necessary to ensure maintenance of current populations in the prairie and achieve population increases in the other areas.

The interest in hunting mule deer in the prairie, parkland, and southern region foothills and mountains (DMAs 1, 2, 3 and 4) will continue to exceed the supply necessitating control of both hunter numbers and distribution. A special licence for antlered and antlerless mule deer (obtained through the draw system) will provide a quality hunt with reduced hunter densities and increased numbers of large bucks, maintain the deer herd at a sustained harvest level, reduce landowner disturbance by hunters and allow direction of hunters to areas where herd reduction to decrease damage is desirable. The system will ensure that everybody has a fair chance to hunt in this area. The shift in hunting pressure

to white-tailed deer in the prairies and elk in the foothills will be closely monitored.

There are considerable differences in opinion within the hunting public respecting the necessity for a special antlered (male) licence in Big Game Zones 6 and 7, and many have suggested continuing to hunt males under a general licence using a 3-point antler size restriction. The concerns identified under the 3-point regime still remain and a shift in hunting pressure from BGZs 8, 9, 10 and 12 to zones 6 and 7 is still anticipated. However, the Division is prepared, on a trial basis, to leave BGZs 6 and 7 open with a 3-point antler size restriction in place. The season will be closely monitored to determine whether the anticipated problems develop.

Habitat retention programs on private land and range improvement/ habitat development programs on adjacent public land, in the prairie, parkland, southern foothills and forest agricultural fringe areas (DMAs 1, 2, 4, 5 and 8), will be successful only if deer damage is minimized. This will require effective damage prevention and expanded damage compensation programs.

4.2 Regional Perspective

4.2.1 Southern Region

The Southern Region (Figure 8) has 41 percent of the provincial mule deer population, hunting pressure is very high and the landscape is dominated by privately owned agricultural land. The population goal for 1996 (Table 24) is 38 800 mule deer in the late summer (preseason). The planned 9 percent increase in population levels by 1996 (Table 24) will occur in the western part of the region in the foothills and mountains. Management emphasis will be directed towards the following:

1. Completing a habitat inventory and assessment for all WMUs in the region.
2. Identifying goals for mule deer populations and for habitat retention and enhancement for all WMUs in the region and developing strategies to achieve these goals.
3. Monitoring populations and habitat to determine the success in maintaining or achieving population and habitat goals.

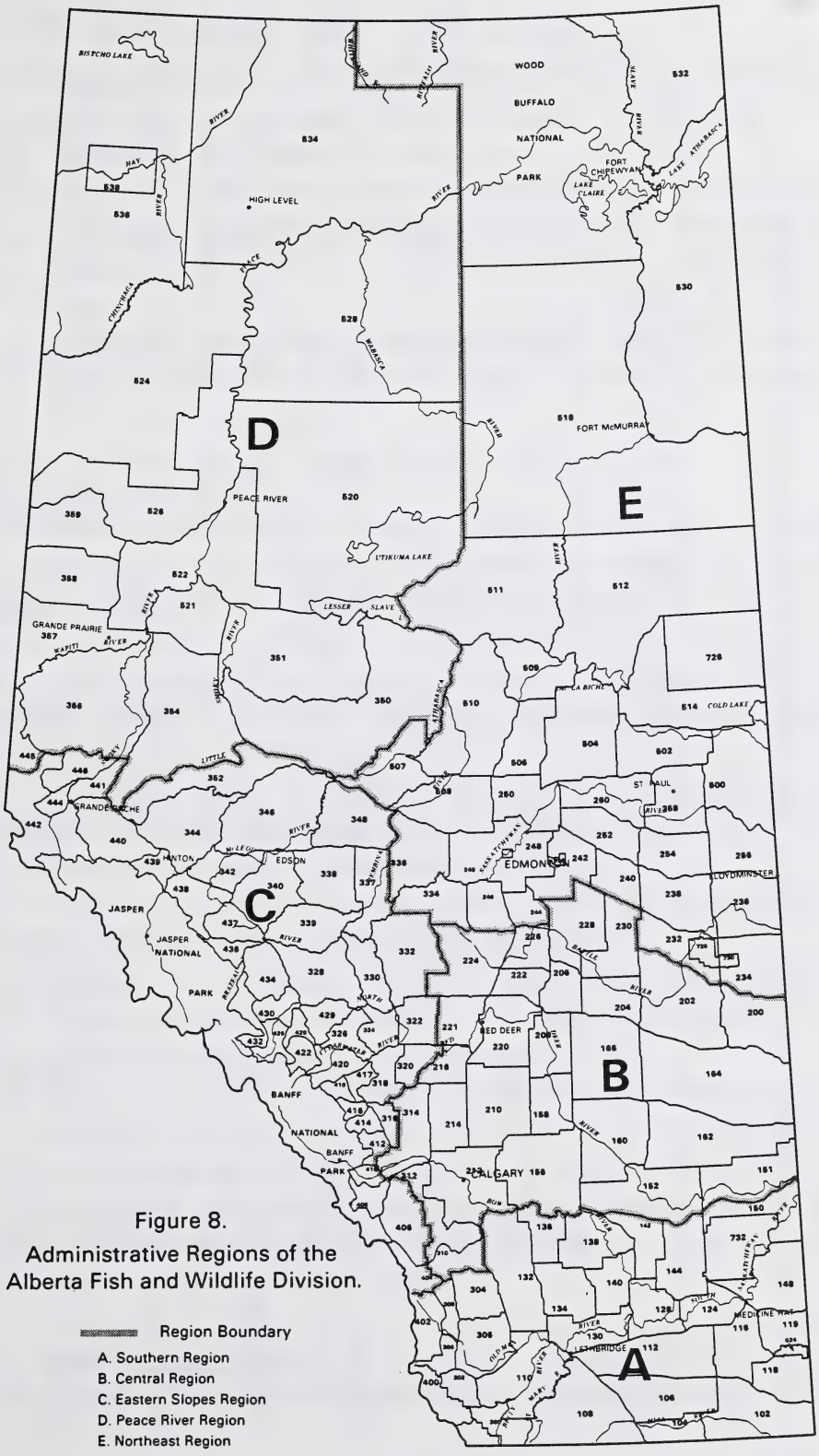

Figure 8.
Administrative Regions of the Alberta Fish and Wildlife Division.

Region Boundary

A. Southern Region
B. Central Region
C. Eastern Slopes Region
D. Peace River Region
E. Northeast Region

Table 24. Mule deer summer population goals by Deer Management Area and Fish and Wildlife Region.

Fish and Wildlife Region		Summer Populations in the Deer Management Areas									
		1	2	3	4	5	6	7	8	9	Total
Southern	1985	19 400	12 900	3 200	0	0	0	0	0	0	35 500
	Increase	0	2 800	500	0	0	0	0	0	0	3 300
	1996	19 400	15 700	3 700	0	0	0	0	0	0	38 800
Central	1985	7 600	3 600	0	6 400	900	0	0	0	0	18 500
	Increase	0	700	0	800	400	0	0	0	0	1 900
	1996	7 600	4 300	0	7 200	1 300	0	0	0	0	20 400
Eastern Slopes	1985	0	0	6 300	0	2 500	4 300	2 900	0	0	16 000
	Increase	0	0	1 000	0	1 000	1 800	0	0	0	3 800
	1996	0	0	7 300	0	3 500	6 100	2 900	0	0	19 800
Peace River	1985	0	0	0	0	0	2 700	100	5 500	2 700	11 000
	Increase	0	0	0	0	0	1 200	0	0	0	1 200
	1996	0	0	0	0	0	3 900	100	5 500	2 700	12 200
North East	1985	0	0	0	1 600	1 600	0	0	0	1 800	5 000
	Increase	0	0	0	200	600	0	0	0	0	800
	1996	0	0	0	1 800	2 200	0	0	0	1 800	5 800
Total	1985	27 000	16 500	9 500	8 000	5 000	7 000	3 000	5 500	4 500	86 000
	Increase	0	3 500	1 500	1 000	2 000	3 000	0	0	0	11 000
	1996	27 000	20 000	11 000	9 000	7 000	10 000	3 000	5 500	4 500	97 000

4. Implementing the new harvest regime with both male and female mule deer on a special licence in all WMUs in the region.
5. Minimizing deer damage on private land.
6. Cooperating with range managers and foresters to develop range management and timber harvesting programs that enhance habitat and increase the mule deer herd in the foothills and mountains.
7. Monitoring the effect of the new mule deer licencing system on white-tailed deer throughout the region and elk in the foothills and mountains.

4.2.2 Central Region

The Central Region (Figure 8) has 21 percent of the provincial mule deer population, hunting pressure is high, habitat is declining and the landscape is dominated by privately owned agricultural land. The population goal for 1996 (Table 24) is 20 400 mule deer in the late summer. The planned 9 percent increase in population levels by 1996 (Table 24) will occur throughout the region. Management emphasis will be directed towards the following:

1. Identifying goals for mule deer populations and for habitat retention and enhancement for all WMUs in the region and developing strategies to achieve those goals.
2. Monitoring populations and habitat to determine the success in maintaining or achieving population and habitat goals.
3. Implementing the new harvest regime with both male and female mule deer on a special licence in all WMUs in the region.
4. Minimizing deer damage on private land.
5. Cooperating with range managers to develop range management and habitat development programs, for public lands, that enhance habitat and increase mule deer herds in specified locations.
6. Monitoring the effect of the new mule deer licencing system on white-tailed deer throughout the region and elk in the southwestern portion of the region.

4.2.3 Eastern Slopes Region

The Eastern Slopes Region (Figure 8) has 19 percent of the

provincial mule deer population and hunting pressure is high, but effort is often secondary to that for moose or elk, which are the primary focus of the hunter. Nonconsumptive use is high, forest maturation and encroachment have made much of the area unsuitable for mule deer and predation may be a significant limiting factor in some locations. The population goal for 1996 (Table 24) is 19 800 mule deer in the late summer. The planned 24 percent increase in population levels by 1996 (Table 24) will occur mainly in the boreal foothills and uplands and should meet some of the demand displaced from the Southern and Central Regions by the new harvest regime. Management emphasis will be directed towards the following:

1. Refining the identification of important mule deer habitat and subsequent population estimates.
2. Identifying habitat enhancement goals and cooperating with foresters and the oil and gas industry to develop timber harvesting and oil and gas exploration and development programs to increase mule deer habitat and populations in specified locations.
3. Implementing the new harvest regime with male mule deer on a special licence in the eastern portion of this region.
4. Monitoring the effect of predators on mule deer numbers in conjunction with ongoing research into the effect of predation on all ungulate species in the Eastern Slopes.

4.2.4 Peace River Region

The Peace River Region (Figure 8) has 13 percent of the provincial mule deer population and hunting pressure is moderate in the settled area and low elsewhere. The landscape is dominated by agriculture in the Peace River country but has extensive forest cover elsewhere. Mule deer are reaching the northern limit of their range in this region because of severe winter weather. The population goal for 1996 (Table 24) is 12 200 mule deer in the summer. The planned 9 percent increase in population levels by 1996 (Table 24) will occur in the southern part of the region in the boreal foothills and uplands. Management emphasis will be directed towards the following:

1. Refining the identification of mule deer habitat and subsequent population estimates.
2. Identifying goals for mule deer populations and for habitat retention and enhancement for WMUs in the southern portion of the region and developing strategies to achieve these goals.
3. Monitoring populations (where feasible) in the south-central portion of the region and habitat to determine the success in maintaining or achieving population and habitat goals.
4. Cooperating with range managers, foresters and the oil and gas industry to develop range management, timber harvesting and oil and gas exploration and development programs that will increase mule deer habitat and populations in specified locations.
5. Minimizing deer damage on private land.

4.2.5 Northeast Region

The Northeast Region (Figure 8) has 6 percent of the provincial mule deer population, the habitat and populations are declining over the southern portion of the region, and hunting pressure is high in the southern and low in the northern portions of the region. The southern landscape is dominated by privately owned agricultural land while the northern portion has extensive forests and mule deer are reaching the northern limit of their range because of severe winter weather. The population goal for 1996 (Table 24) is 5800 mule deer in the summer. The planned 16 percent increase in population levels by 1996 (Table 24) will occur in the boreal forest agriculture fringe. Management emphasis will be directed towards the following:

1. Identifying goals for mule deer populations and for habitat retention and enhancement for WMUs in the southern portion of the region and developing strategies to achieve these goals.
2. Monitoring populations and habitat to determine the success in maintaining or achieving population and habitat goals.
3. Implementing the new harvest regime with both male and female mule deer on a special licence in the southern portions of the region.
4. Cooperating with range managers, foresters and the oil and gas industry to develop range management, timber harvesting and oil

and gas exploration and development programs that increase mule deer habitat in the forest-agricultural fringe.

5. Minimizing deer damage on private land.

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APPENDIX I

Provincial Survey Format for Mule Deer and White-tailed Deer, July 1985

PROVINCIAL SURVEY FORMAT

MULE DEER AND WHITE-TAILED DEER

PRIMARY MANAGEMENT UNITS

Primary Management Units (PMUs) have deer populations of similar density and productivity, hunting pressure and geographical and habitat features. Three deer PMUs have been identified (Map 1, Table 1) each of which encompasses several Big Game Zones. Harvest strategies are developed at the Big Game Zone level. Authorization hunts are administered at the WMU level and thus surveys are required within each WMU.

PMU A: Big Game Zones 7 (except 314), 8, 9 and portions of 10 and 12.

This zone contains some of the highest densities of deer in the province as well as excellent habitat that contributes to high productivity.

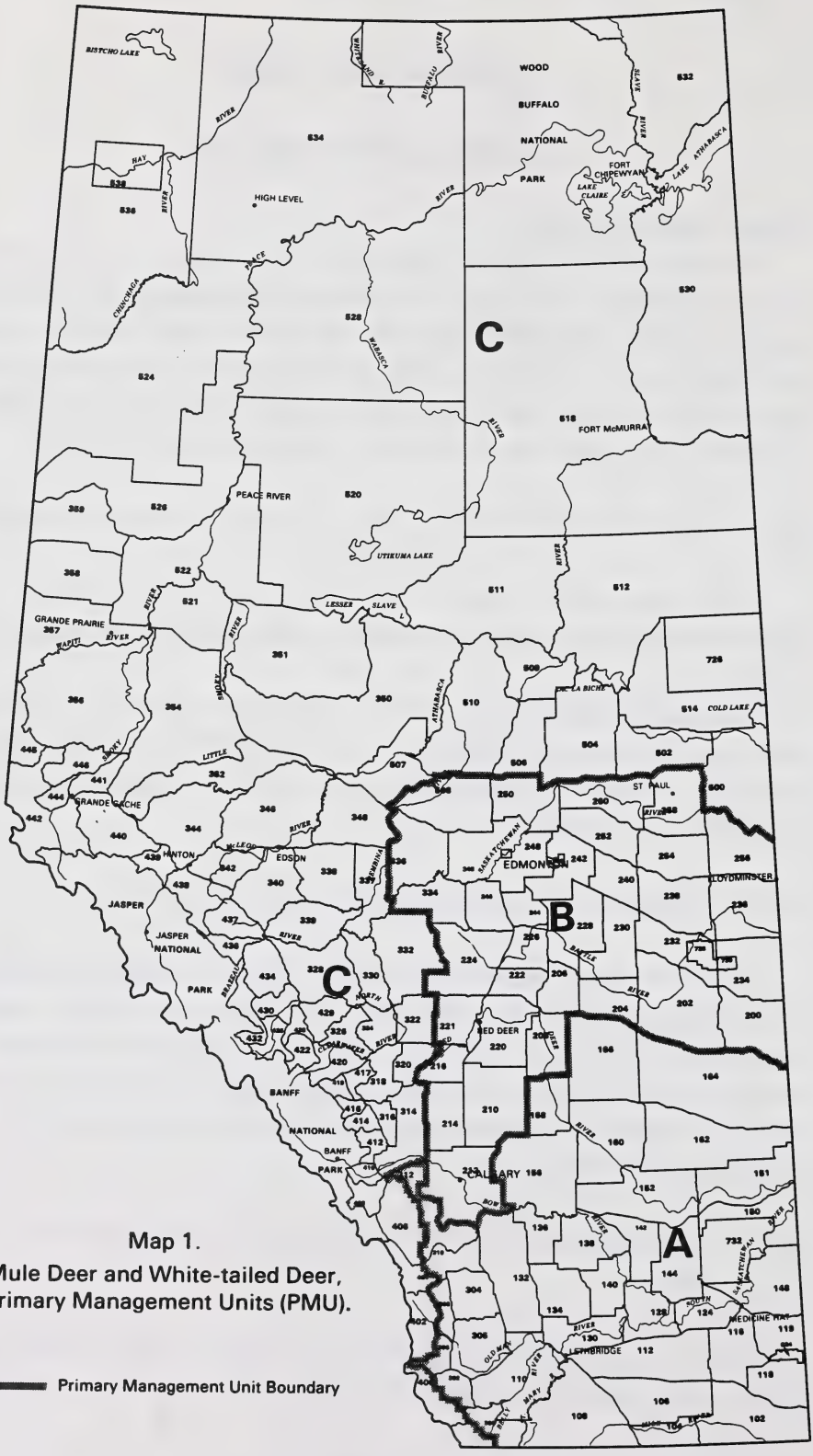
Surveys are required to monitor population trends and to provide population estimates on a WMU basis, where authorization hunts are scheduled. Generally, survey precision is good although snow cover in the south is unreliable.

PMU B: Big Game Zones 11 and portions of 10, 12 and 15.

Primarily aspen parkland/mixed agriculture, this area supports a high population of white-tailed deer. Mule deer are high in numbers in the southern portion of this PMU. Surveys are required to monitor population trends and to provide estimates when authorization hunts are scheduled. Habitat stratification is required with survey blocks distributed accordingly.

PMU C: Big Game Zones 1, 2, 3, 4, 5, 6, 13, 14, 16 and WMU 314 from Zone 7.

This includes the boreal, alpine and foothill areas of the province. Deer numbers are lowest in the northern boreal area, but increase



Map 1.
Mule Deer and White-tailed Deer, Primary Management Units (PMU).

Primary Management Unit Boundary

Table 1. Deer information by Primary Management Unit.

PMU	Productivity	Density	Distribution	Habitat Quality/ Distribution	Hunting Pressure	Surveyability
A	High	High	Uniform	Good/ Discontinous	High	Good
B	High to Moderate	High to Moderate	Uniform	Good/ Discontinous	High	Good
C	Low/ Moderate	Very Low to Moderate	Sporadic	Poor/Moderate Discontinuous	Low to Moderate	Poor to Moderate

along the major waterways, in the southern alpine and in the foothills. Low densities, extensive coniferous forest cover and rugged terrain make surveying unfeasible.

SURVEY CRITERIA

The broadest level at which deer are managed is the Primary Management Unit. PMUs are prioritized for surveying according to the following:

1. Their potential for providing the maximum amount of recreational deer hunting,
2. The feasibility and reliability of surveys.

WMUs within PMUs to be surveyed on a rotational basis are prioritized according to surveyability and recreational contribution.

The following set of survey criteria for deer is consistent with the above rationale.

1. Surveys will not be conducted in PMU C because of poor surveyability. An inventory approach will be developed for this area in the species management plan.
2. Surveys will be conducted in those PMUs with high hunting pressure and good surveyability (A and B).
3. PMU A: Southern Region
   a. All WMUs in the traditional Foothills and Western Prairie Deer Survey areas will be surveyed every second year.
   b. WMUs in the traditional Prairie Deer Survey area will be surveyed on a two-year rotational basis.

   Central Region
   a. WMUs will be surveyed on a three-year rotation.
4. PMU B: WMUs that are surveyable and provide moderate to high recreational contribution within the PMU (Table 2) will be surveyed on a three-year rotation.

SURVEY DESIGN

Table 3 provides the provincial survey design for deer based on the above criteria. Rotation of surveys through WUMs reflects an attempt to spread annual coverage throughout the PMU.

Table 2. WMU surveyability and recreational contribution to deer hunting within PMU B.

WMU	SURVEYABILITY	RECREATIONAL CONTRIBUTION
200	Good	High
202	Good	High
204	Good	Moderate
206	Good	Moderate
208	Good	High
210	Poor	Low
212	Poor	Low
214	Poor	Low
216	Fair	High
220	Good	Moderate
221	Poor	Low
222	Poor	Moderate
224	Good	Moderate
226	Good	Moderate
228	Poor	Low
230	Poor	Low
232	Fair	High
233	Good	High
234	Poor	High
728/30	Good	High
236	Good	High
238	Good	High
240	Poor	Low
242	Good	High
244	Poor	Moderate
246	Poor	Moderate
248	Poor	Low
250	Fair	High
252	Poor	Moderate
254	Good	High
256	Good	High
258	Good	High
260	Poor	High
334	Poor	High
336	Poor	High
508	Fair	High

Table 3. Provincial survey design for mule deer and white-tailed deer.

REGION	SURVEY	PMU	WMU	YEAR 1 AIRCRAFT HOURS	YEAR 1 COST ($)[a]	YEAR 2 AIRCRAFT HOURS	YEAR 2 COST ($)[a]	YEAR 3 AIRCRAFT HOURS	YEAR 3 COST ($)[a]
SOUTHERN	WESTERN PRAIRIE	A	108						
			110						
	Sub-Total			10 (RW)	4 500	-	-	10 (RW)	4 500
	FOOTHILLS	A	300						
			302						
			304						
			305						
			306						
			308						
	Sub-Total			10 (RW)	4 500	-	-	10 (RW)	4 500
	PRAIRIE	A	102			x			
			104					x	
			106					x	
			108			x			
			112			x			
			116			x			
			118					x	
			119					x	
			124					x	
			128			x			
			130					x	
			132[b]					x	
			134			x			
			136[b]			x			
			138[b]					x	
			140[b]					x	
			142[b]			x			
			144			x			
			148			x			
			150					x	
	Sub-Total			-	-	20 (RW)	9 000	20 (RW)	9 000
SOUTHERN Sub-Total				20 (RW)	9 000	20 (RW)	9 000	40 (RW)	18 000

Table 3 (Continued).

REGION	SURVEY	PMU	WMU	YEAR 1 AIRCRAFT HOURS	YEAR 1 COST ($)	YEAR 2 AIRCRAFT HOURS	YEAR 2 COST ($)	YEAR 3 AIRCRAFT HOURS	YEAR 3 COST ($)
CENTRAL	PRAIRIE	A	150	x					
			151	x					
			152			x			
			160					x	
			162					x	
			164			x			
			166	x					
	Sub-Total			7 (RW)	2 450	16 (RW)	5 600	7 (RW)	2 450
	WESTERN PRAIRIE	A	156			8 (RW)	2 800		
			158					8 (RW)	2 800
			310	8 (RW)	2 800				
			312	15 (RW)	5 250				
	Sub-Total			23 (RW)	8 050	8 (RW)	2 800	8 (RW)	2 800
	PARKLAND	B	200					16 (FW)	2 560
			202	20 (FW)	3 200				
			204					8 (FW)	1 280
			206	7 (FW)	1 120				
			208			8 (RW)	4 720		
						12 (FW)			
			216			8 (FW)	1 280		
			220					4 (RW)	3 960
								16 (FW)	
			224	20 (FW)	3 200				
			226			5 (FW)	800		
	Sub-Total			47 (FW)	7 520	8 (RW) 25 (FW)	6 800	4 (RW) 40 (FW)	7 800
CENTRAL	Sub-Total			30 (RW)	18 020	32 (RW)	15 200	19 (RW)	13 050
				47 (FW)		25 (FW)		40 (FW)	

Table 3 (Continued).

REGION	SURVEY	PMU	WMU	YEAR 1 AIRCRAFT HOURS	YEAR 1 COST ($)	YEAR 2 AIRCRAFT HOURS	YEAR 2 COST ($)	YEAR 3 AIRCRAFT HOURS	YEAR 3 COST ($)
NORTH EAST	PARKLAND	B	232			8 (RW)	2,800		
			236	9 (RW)	3 150				
			238					10 (RW)	3 500
			242[c]						
			250					5 (RW)	1 750
			254	10 (RW)	3 500				
			256			5 (RW)	1 750		
			258					10 (RW)	3 500
			508			10 (RW)	3 500		
			728[d]	6 (RW)	2 150	6 (RW)	2 150	6 (RW)	2 150
			730[d]						
NORTH EAST Sub-Total				25 (RW)	8 800	29 (RW)	10 200	31 (RW)	10 900
TOTAL				75 (RW) 47 (FW)	35 820	81 (RW) 25 (FW)	34 400	89 (RW) 40 (FW)	41 950

[a]Cost calculated using: Southern Region - $450/hour rotary wing (RW) (Charter - "dry" rate).
Central Region - $350/hour rotary wing (RW) (Government - "dry" rate).
- $160/hour fixed wing (FW) (Charter - "dry" rate).
North East Region - $350/hour rotary wing (RW) (Government - "dry" rate).

[b]No present coverage. To be added to Prairie format after 1985/86 design is completed (five hours allocated).

[c]Annually covered by Blackfoot-Ministik elk survey.

[d]Annually covered (Camp Wainwright).

NOTE: Battle River and Suffield are considered "inventory" and "special" surveys, respectively, and are not included in this survey design.

1. Survey intensity should provide population estimates within plus or minus 30% precision.
2. Two types of survey designs should be used:
    a. In prairie WMUs (PMU A) permanent blocks of known area and located within good deer habitat,
    b. In parkland WMUs (PMU B) random stratified 2.6 km^2 (1 $mi.^2$) quadrats.
3. All deer habitat in each WMU of PMUs A and B should be mapped and measured. This habitat mapping should be updated every five years.

APPENDIX II

Deer Habitat Mapping and Assessment Techniques used by the Central and Northeast Regions

THE PROCEDURES USED FOR THE HABITAT STRATIFICATION FOR DEER IN THE CENTRAL REGION

After receiving numerous unsatisfactory results from the satellite imagery program it was decided to go back to manual interpretation of aerial photographs for habitat stratification. In the winter of 1984-85, six WMUs (200, 208, 220, 228, 230 and 314) were chosen for the habitat stratification program. Since the majority of each WMU was photographed between 1981-83, the photos provided relatively up-to-date information on development within individual WMUs.

With sufficient manpower, the rest of the WMUs in the Central Region will be stratified by 1987-88 using the procedures listed below.

The following guidelines and procedures were used to produce the colour-coded habitat stratification on a mylar base:

1. It was decided to go back to five habitat classes (0-12, 13-30, 31-49, 50-74, 75-100) according to percent cover and/or topography. The river systems were not done separately.

2. It was assumed that white-tailed deer would inhabit any area with sufficient cover.

3. It was assumed that mule deer would inhabit any area with sufficient cover, as well as sandhills, unbroken shrubland and the treeless and rugged riparian zone along major watercourses. All were considered habitat and the percent of each were included in the total.

4. The WMUs were outlined on 1:250 000 scale NTS maps and a 1:250 000 scale blank map, with the square miles and townships penciled in, was constructed for each WMU.

5. All the <u>whole</u> square miles were sequentially numbered from left to right on the NTS map giving the total square miles in the particular

WMU. Partial square miles, around the periphery of the WMUs were ignored.

6. All the air photos required were interpreted at the Map and Air Photo Division, 2nd Floor, Petroleum Plaza, North Tower.

7. The square miles were measured on the different scale air photos and similar size holes were cut out of cardboard. When placed on the air photo an estimation of the amount of habitat within the square mile could be identified more easily. A large suspended magnifying glass was also used for difficult photos. This was borrowed from the Bramalea Building.

8. The visually estimated amount of habitat was then recorded on the corresponding blank square mile at 1:250 000 scale.

9. When two sets of numbers appear in a square mile unit, e.g., 20/5, the top number represents percent habitat and the bottom one percent water.

10. For easy reference, all the pertinent information was taken off each line of air photos and recorded beside the corresponding square mile coverage on the blank 1:250 000 map. The data included the series (e.g., AS2736), photos (e.g., 227-241), date and line number.

11. A sheet of mylar, with the WMU, townships and square miles drawn on it in India ink, at the 1:250,000 scale, was placed on top of the map with the percent habitat. Four colours were designated to four coverage classes (13%-30%, 31%-49%, 50%-74% 75%-100%), while a fifth class (0%-12%), which was usually most numerous, was left clear. The colours were put on the mylar using coloured pencils.

12. A legend was put on the final copy that included the colour and percent cover in each class, the number of square miles in each class and the percent of each class in the WMU.

13. Another mylar, with the square miles drawn on, depicted the area and the year of the air photo coverage.

A tentative schedule to complete an additional seven WMUs (151, 166, 202, 206, 224, 310 and 312) has been approved for the winter of 1985/86.

August 1985

WILDLIFE RESOURCE ASSESSMENT PROGRAM - NORTHEAST REGION

This regional program includes a complete wildlife resource assessment program, but only the habitat stratification component will be presented here. The focus is white-tailed deer but the stratification could be adapted for mule deer.

A. Vegetative Cover Mapping

Map the following on 1:50 000 topographic maps using 1982 aerial photography.

(a) WMUs in Zones 10, 11, 12, 13, 14 and 15.
- tree cover
- native grassland
- cropland
- riparian zones
- waterbodies

(b) WMUs in Zones 13, 14, 16 and 1.
- tree cover - conifer, deciduous, mixed, treed muskeg, open muskeg, riparian areas, waterbodies

B. Habitat Mapping

Habitat mapping will be done for five indicator species as follows:

- Zones 10, 11, 12 and 15 - primary white-tailed deer (upland forest)
  - sharp-tailed grouse (upland non-forest)
  - waterfowl (wetland)
  - furbearers (muskrat/beaver) - (wetland)

- Zones 13 and 14
  - primary white-tailed deer (in the agricultural portion of these zones)
  - sharp-tailed grouse
  - waterfowl
  - primary moose (in the forested portion of these zones)
  - fur (various)

- Zones 1 and 16
  - primary moose
  - waterfowl
  - fur (various)

B. (1) Primary White-tailed Deer Habitat

Using vegetative cover maps, each WMU will be mapped as follows on mylar overlay:

Class I (green) - indicates areas containing a minimum of 65 ha (160 ac.) of more-or-less continuous tree cover and incorporating neighboring bluffs greater than 4 ha (10 ac.) that are within 1.6 km (1 mi.) of the major block and within 1.6 km (1 mi.) of one another. It includes river breaks and areas of steep topography.

This is considered to be the best habitat and where deer will be present year-round including in severe winters.

Class II (red) - includes areas with vegetative characteristics similar to Class I except on gentler sloping topography and more interspersed with agricultural cropland.

It is considered good deer habitat, where deer will be present year-round and where agricultural products greatly influence winter deer distribution. Overall deer densities are generally less than in Class I.

Class III (orange) - includes areas containing bluffs of 4 ha to 65 ha (10 to 160 ac.) of tree cover. Contiguous areas include all such bluffs that are within 1.6 km (1 mi.) of one another. This is considered fair deer habitat, but deer are present only during mild winters.

Class IV (black) - includes areas containing cropland, open areas, water, industrial and urban development where tree cover occurs in less than 4 ha (10 ac.) bluffs.

It is considered poor deer habitat and for practical purposes is considered to support no deer.

Note: The boundary for Class I, II and III is determined by a line approximately 150 m from the contained tree cover.

APPENDIX III

Mule Deer Stable Population Model for the Alberta Prairie/Parkland Region

MULE DEER - MODEL FOR STABLE POPULATION
ALBERTA PRAIRIE/PARKLAND

	Females			Males		
Time of Year	Adult	Yearling	Fawn	Adult	Yearling	Fawn
Late Spring	1000	300	890	290	300	890
Summer Mortality	0	0	410(46%)	0	0	410(46%)
Fall (preseason)	1000	300	480	290	300	480
Hunting/Winter Mortality	220(22%)	80(27%)	180(38%)	140(48%)	160(53%)	180(38%)
Early Spring	780+220	300		150+140	300	

Season	Number of Deer	Buck:Doe:Fawn Ratio
Late Spring	3670	45:100:137
Preseason	2850	45:100:95
Late Winter	1890	29:100:60

1. Potential increase 1.9 times comparing early spring to late spring.

2. Preseason population is 1.5 times larger than early spring.

3. Preseason population is 1.3 times larger than postseason.

Antlered Harvest Goal = 11% of the preseason population.
Antlerless Harvest Goal = 12% of the preseason population.

Rationale for the Mule Deer Stable Population Model for the Alberta Parkland/Prairie Area

1. It was assumed that the fetal rate of 1.78 fawns/doe (for does older than one year) and 0 fawns/doe for yearlings (Wishart, pers. comm., sample of 29 does) represents an average event in the Parkland/ Prairie Area.

2. It was assumed that the survival rate for fetuses through to becoming preseason fall fawns was 54 percent as found by Hall (1973) for white-tailed deer at Camp Wainwright 1967-72.

3. It was assumed that yearlings would comprise 23 percent of the spring doe population as found in the subsequent fall harvest data 1978-83 (Treichel, annual incisor bar age reports n = 1930).

4. It was assumed that the combined hunting/winter mortality of fawns would be equal in both sexes and would lead to a spring doe population consisting of 23 percent yearlings.

5. It was assumed that yearling males would comprise about 51 percent of the hunting/winter kill mortality, the same proportion that was found in 2058 hunter kills submitted for jaw-aging in 1979-1983 (Treichel, annual incisor bar age reports).

6. It was assumed that mortality rates in the antlerless cohort, resulting from the hunter harvest, would reflect a strong selection of does over fawns, but that winter mortality of fawns would be much higher than for does. The age data for 2327 hunter kills submitted in 1978-83 indicates a harvest consisting of 64 percent adults, 19 percent yearlings and 17 percent fawns compared to a preseason population of 56 percent adults, 17 percent yearlings and 27 percent fawns. Yearling/adult doe ratios in the harvest indicate that fawn mortality is higher than adults during the winter period.

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